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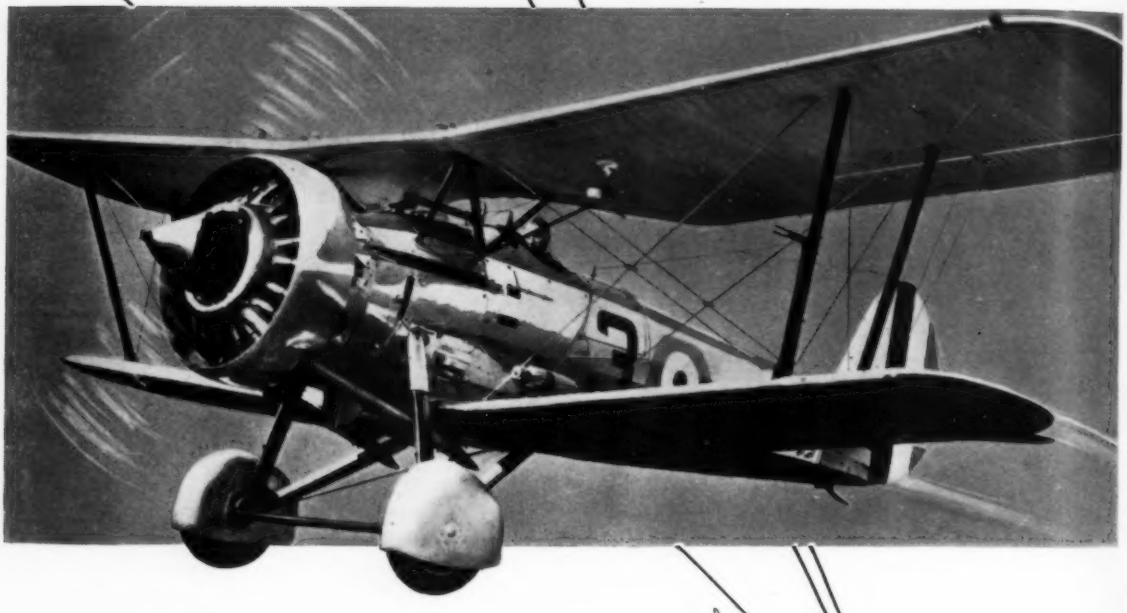

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The AIRCRAFT ENGINEER AND AIRSHIPS

First Aeronautical Weekly in the World. Founded January, 1909

Founder and Editor: STANLEY SPOONER

A Journal devoted to the Interests, Practice and Progress of Aerial Locomotion and Transport

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DIARY OF CURRENT AND FORTHCOMING EVENTS

Club Secretaries and others desirous of announcing the dates of important fixtures are invited to send particulars for inclusion in this list:—

1933.
Apr. 27. "Seaplane Research," Lecture by H. M. Garner before R.Ae.S.
Apr. 28. A.I.D. Technical Staff Association Annual Dinner, Holborn Restaurant.
Apr. 29. No. 34 Sqdn. Reunion Dinner, Ship Restaurant, Whitehall.
May 1. Entries close at ordinary fee for King's Cup Race.
May 5. Opening of Inverness Municipal Airport.
May 16-22. International Rally, Vienna.
May 19. Entries close at double fee for King's Cup Race.
May 20. G.A.P.A.N. Annual Civil Air Display, Brooklands.
May 20-22. Scottish Flying Club Annual Display, Renfrew.
May 25. Tourist Rally at Wiesbaden.
May 27. Reading Ae.C. Annual "At Home."
May 28. Deutsch de la Meurthe Cup, Etampes.
May 29. Opening of R.A.F. Rifle Association's Meeting at Bisley.
May 30. Wilbur Wright Memorial Lecture before R.Ae.S.
June 4. Skegness Flying Meeting.
June 5. "Morning Post" Race, Heston.
June 8. Lincs. Ae.C. Air Pageant and Opening of Aerodrome at Holton-le-Clay, Grimsby.
June 5. Northamptonshire Ae.C. Annual Air Pageant.
June 7. Household Brigade Flying Club Meeting.
June 10. Henly's Rally, Heston.
June 11. International Meeting, Brussels.
June 15-18. Aero Club of France Tourist 'Plane Meeting.
June 16. Mayor's Aerial Garden Party, Eastbourne.
June 16-17. Oxford University Air Sqdn. Dinner, Clarendon Hotel, Oxford.
June 17. Bristol Airport Flying Meeting.
June 17. Charity Air Display at Maidstone Airport.
June 21. Official Opening of Norwich Municipal Airport by H.R.H. the Prince of Wales.
June 24. Royal Air Force Display, Hendon.
June 26. S.B.A.C. Aircraft Display and Exhibition, Hendon.
July 1. Merseyside Aviation Display and Opening of Speke Aerodrome, Liverpool.
July 1-4. U.S. National Air Races, Los Angeles Airport.
July 2. 12-Hour Contest of Distance, Angers.
July 8. King's Cup Air Race, Hatfield.
Aug. 4, 5, 7. International Air Race Meeting, Portsmouth.

EDITORIAL COMMENT

CIVIL flying-boat design came to a temporary standstill in this country when work was stopped on the six-engined Supermarine, and it is to the Royal Air Force that we must look for the development of the flying-boat type. The Service is only too anxious to push the matter ahead, for it is in need of new types. Its present equipment of "Southamptons," "Irises" and "Rangoons" is sound, for all these are really good boats, but all three designs are more or less antiquated. The "Southampton," in particular, has a remarkable record. Few people could say offhand exactly how many years have passed since it was first adopted as a replacement for the "F. 5." At that time the "Southampton" was well ahead of its time. Had it been allowed by the Air Ministry to enter for F.A.I. competitions, it would certainly have established several world's records for Great Britain, at a time when we actually held none. The Air Council of the day evidently did not think that records were worth accumulating, and they cared no more for encouraging the export of British aircraft to foreign countries. It was understood at the time that they were satisfied to have secured for the Royal Air Force a type of boat which would fulfil all their requirements for at least five years. That lustrum has been handsomely exceeded, and still four of our seven flying-boat squadrons are using the good old "Southampton." These squadrons are No. 201 at Calshot, No. 204 at Mount Batten, No. 205 at Singapore and No. 210 at Pembroke Dock. It is quite time that all of these units received a more modern type. Of the other F.B. squadrons, No. 202 at Malta has not got boats at all, but is temporarily equipped with Fairey "3 F" floatplanes, No. 203 at Basra has the "Rangoon" and No. 209 at Mount Batten has the "Iris." The "Rangoon" is the most modern of these types, but is too slow for the needs of the present day. The "Iris" is the largest of our Service flying boats and has the longest range, but its engines are not of the latest Rolls-Royce type,

R.A.F. Flying Boats

and for that reason alone, if for no others, it is time that a new type be chosen as standard equipment. The Malta squadron is the worst off of any. A flying-boat squadron should have flying boats, and though the Fairey " 3 F " is still a sound machine, even in its landplane and ship-plane forms it is now regarded as obsolescent. When it was at its best, it was a strange expedient to equip a flying-boat squadron with floatplanes, and to keep it for year after year on what was officially admitted to be only temporary equipment. In fact, new types of flying boats are really a crying need.

Size is naturally a desideratum in flying boats, for the larger the hull the greater degree of seaworthiness which can be given to it. It need not be emphasised that seaworthiness in proportion to size is a primary requirement in all types of this class of aircraft. Taking this for granted, the two other chief qualities called for are speed and range, the latter depending on load-carrying capacity. The ideal boat would give a high degree of both; but we must progress by stages towards the ideal. At present it may be necessary to have two different types in the Service, one giving a high speed and the other a long range. In fact, some authorities think that we may delimit the spheres of the two types by choosing fast boats for work in Home waters, where much of the work in wartime would be anti-submarine patrols, and long-range boats for work in the outer Empire, where the ability to get from one British station to another would be more important than the speed at which the machine could fly. Survey, showing the flag, and reinforcement, may be taken as among the chief duties of the overseas F.B. squadrons. The " Rangoons " of No. 203 have surveyed the Arabian coast of the Persian Gulf for Imperial Airways, and the " Southamptons " of No. 205 have done similar work between Singapore and Australia. As a useful criterion of our needs, we may set up a non-stop flight from Mount Batten to Gibraltar, and another from the Rock on to Malta. The former flight has been accomplished once, but by a type which has not been adopted as standard Service equipment.

It is good news that the Air Ministry is about to place an order with Short Bros., Ltd., of Rochester, for a number of " Singapore " flying boats with which to re-equip No. 210 F.B. Squadron at Pembroke Dock. The type chosen is a slightly improved version of the " Singapore 2," with four Rolls-Royce " Kestrel " engines arranged in two nacelles, one pusher and one tractor in each. The type when issued will be known as " Singapore 3," though it does not differ from its predecessor to the same degree as the " 2 " type differed from the original " Singapore." This boat will belong to the fast class, which is by many considered as best suited to Home waters, and is expected to develop a speed of 140 m.p.h., and if it fulfils these expectations it will be at least 30 m.p.h. faster than any of the three types now in use in the Service. It is also expected to have a still-air range of about 1,000 miles. This would take the boat to Gibraltar by a straight line, but not if all foreign territory were to be avoided, as would be desirable in time of war, even though Portugal is our oldest Ally, and has always been most helpful in granting us facilities in wartime—particularly in allowing our troops to land at Lorenço Marques during the South African war. For Empire purposes we need a boat which can manage a flight of 1,250 miles comfortably, without having to wait for a favouring wind.

The " Singapore 3 " is a result of a previous Air Ministry competition. Another competition is now being held, which may perhaps produce the long-range boat needed for Empire work. In the meantime extended trials are to be made of the " Southampton 4," which has two " Kestrels " situated just under the upper plane. It is believed to be the fastest flying boat in the possession of the Royal Air Force. The programme is for this machine to fly non-stop to Etang de Berre, the seaplane port of Marseilles, and thence non-stop to Malta, where she will be put through extended trials for some months in the Mediterranean. Each of these flights is about 800 miles in length. One trip planned for her is down the Red Sea to Port Sudan, which will test the behaviour of the machine in tropical conditions. Until these trials have been concluded and the report on them has been considered by the Air Ministry, it is impossible to forecast whether this type will be selected as Service equipment. There is always a possibility that while a type is still considered as experimental, one squadron may be equipped with it so that full experience may be gained. This activity on the flying boat side of the R.A.F. is very welcome. At the same time the result of the competition for long-range flying boats will be awaited with extreme interest.

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Sir Henry Royce

It is with great regret that we hear of the death of Sir Henry Royce. His name will always be remembered in association with that of the late Hon. C. S. Rolls in the title of the best motor-car in the world. Throughout the world this pre-eminence of the Rolls-Royce car is ungrudgingly acknowledged. Other makers have considered questions of economy in first cost and in upkeep. It is well that there should be firms who take this line, for buyers are of all classes. It is also well that there should be at least one firm which considers only the provision of the very best. We all take legitimate pride in the thought that the best car should be a British production.

The names of both Rolls and Royce are highly honoured in the world of aeronautics, but it is a curious fact that the honour gained by each in connection with flying was quite independent of the work of the other. When Mr. Rolls made a great name for himself by making the first non-stop flight across the Channel and back, Mr. Royce was not in the least interested in anything but road transport. When Mr. Royce took up the design and manufacture of aero engines, Mr. Rolls, alas! was dead. On the road the two were united. In the air they worked each by himself. In both spheres each attained great distinction. Yet, despite this independence, the names of the two men are inseparably connected, and will probably remain so for as long as anyone now living can see ahead. Another curious fact about this unusual association is that while the one man was born in a titled family, the other, starting from rather humble beginnings, won for himself a hereditary title. It is a matter of general regret that there is no heir to the Royce baronetcy, but, as we have said, the name of Royce will not readily be forgotten.

International Air Races

Interesting Event to be held at Portsmouth on August 4, 5 and 7

AS briefly announced in our issue of April 13, a company has been formed to promote the holding of annual air races of an international character, and the first of these events is scheduled to take place at the Portsmouth and Southsea Airport in August Bank Holiday week. The minimum prize money of £5,000 has now been guaranteed, and the races have the support of the Royal Aero Club of the United Kingdom. Not for very many years, in fact not since the early days of flying, has prize money of anything approaching this value been offered in Great Britain, and this should mean that, in spite of the rather short notice, there should be no lack of entries, except possibly in the unlimited class. As we have previously announced, the races will be for aeroplanes divided into three classes*:—

Class A—Unlimited engine capacity. Speed at least 170 m.p.h.
Class B—Engines up to 8.75 litres. Speed at least 160 m.p.h.
Class C—Engines up to 6 litres. Speed at least 150 m.p.h.

These qualifying speeds will be measured over a 1-km. course, and so long as intending competitors can attain them there will, of course, be no need for them to go "all out," so that the qualifying trials will not necessarily give any indication of the real abilities of the various machines.

Provided there are six entrants in each class, the following minimum prizes will be awarded:—First, £1,000; second, £450; third, £150; fourth, £50. The entrance fee will be £25 per machine.

* Since this article was written it has been rumoured that certain changes may be made, and that class C engine capacity may be increased to 6.5 litres, and the qualifying speeds decreased to 140 m.p.h. and 130 m.p.h. for classes B and C respectively.

The course for the races will be a pylon circuit surrounding Portsmouth aerodrome, and will be approximately 10 miles in length. No race will be more than 100 miles in length, *i.e.*, 10 laps, and in the interests of safety not more than five machines will fly around the course at a time. If the number of entries is greater than five, the race in each class will be divided into heats, and the five fastest aeroplanes in each class, irrespective of the heats in which they fly, will be eligible for the final in their class.

Further particulars will be published when they have been approved by the Royal Aero Club.

With such substantial prizes offered there should be a large list of entries, at any rate in classes B and C. In the unlimited class, A, one may expect to see some single-seater fighters, as there is, apparently, not to be restrictions of any sort on the type of machine which may be coupled to an engine of unlimited capacity. The nearest engine we have in Great Britain to "unlimited" capacity is the Rolls-Royce "R" of the Schneider machines, and if the Vickers-Supermarine firms should decide to send the S.6B around the course they would, presumably, make sure of the £1,000, as the machine could start from Southampton Water or the Solent when the other unlimited machines were in the air and still cross the starting line and finish well ahead of the others at a very comfortable cruising speed!

Time will hardly permit the building of machines specially for the race, at any rate in the unlimited class, and British entrants are therefore likely to be confined to single-seater fighters and the like, some of which could, of course, be made to put up some very impressive speeds by taking off their military equipment, "cleaning up" a little, and use full supercharge with doped fuel. It is hoped that entries may be received from abroad, and particularly it is considered likely that we may have the

PORTSMOUTH AIRPORT FROM ABOVE: This large and modern aerodrome is the venue of the High-Speed Race Meeting which is being held on August 4, 5 and 7. The aerodrome is under the control of Portsmouth, Southsea & Isle of Wight Aviation Co. and it is from here that the daily services to Ryde, Shanklin and Shoreham is run. (FLIGHT *Photo.*)

pleasure of seeing some of the famous American, and perhaps some Italian, machines at Portsmouth.

Until details are available it is not possible to express an opinion of the safety of the course at Portsmouth, but from the fact that the circuit will be in the region of 10 miles it is obvious that all the pylons cannot be inside the aerodrome boundaries. To the east of the aerodrome is Langston Harbour, and to the north and west is fairly open country, so that only on the Portsmouth side should there be any risk of competitors getting over populated districts. Doubtless the course will be so arranged that in this direction the pylon or pylons will be near or on the aerodrome. If that is done, we see no reason why the Portsmouth high-speed course should not be a good one, and about as safe as could be arranged.

In the limited capacity classes, B and C, there are quite a number of machines which could qualify for the speed requirements. For example, in class B, of fast machines fitted with engines within the 8,750-c.c. limit, there are the Percival "Gull" with the Napier E.97 engine, the "Gipsy Major" and the "Hermes IV," all three of which fall between 8,750 c.c. and 6,000 c.c. capacity, and all of which should be well able to do the 140 m.p.h. stipulated. The Comper "Swift" with "Gipsy Major" would be a fairly easy adaptation, and would be well above the 140 m.p.h. demanded in class B. In fact, it already exceeds that speed when fitted with the "Gipsy III."

In class C a great number of types are already in existence, and anyway there would be time to design and build small machines specially for the race, in which case a large number of engine types are available, such as the "Gipsy II and III," the "Hermes II and IIB" and the 5-cylinder "Genet Major." For pure racing purposes twin-engined machines might be at some little disadvantage, but something could be done, within the cylinder capacity, with two Pobjoys, for example.

If engine manufacturers are willing, and have the time, to develop superchargers, the position becomes extremely interesting, as with doped fuels much greater power could probably then be extracted from the given capacity for a sufficient length of time to cover the 100 miles or so.

Altogether, we welcome the formation of an annual international air race, which cannot fail to do a very great deal to stimulate interest in air racing, and which, with proper organisation, should not be unduly dangerous. We say unduly advisedly, because a certain element of danger there must always be. But so there is in all forms of racing, and provided reasonable safeguards are taken, especially in the matter of ensuring that the general public shall not be subjected to any risk, we do not think this need be regarded as a serious objection. The organisers are quite obviously fully alive to the need for taking reasonable precautions, and by limiting the number of machines in each event to a maximum of five there should not, except for sheer reckless cornering, be any undue risk due to crowding. Even at the start, when the machines take off in line, it should be possible to ensure sufficient spacing between them.

AFRICA'S FIRST AERIAL STOWAWAY

A FEW weeks ago Capt. R. F. Caspareuthus piloted the Imperial Airways machine *City of Baghdad* off the landing ground at M'Byea, Tanganyika. On rising into the air he realised the machine was tail heavy, and it was only after a little hesitation that he decided to carry on. On landing at his destination he saw the machine safely stowed away for the night and sat down to his dinner. There entered a bland young man who expressed a desire to see the German Consul. "Afraid you won't find a German Consul in a place like this. But where have you come from?" "Tanganyika," replied the young man. "Flying?" inquired Caspareuthus. The young man nodded, and on being asked where his machine was, replied, grinning, "I flew in your machine." "Not as a passenger?" "No, as a stowaway." Caspareuthus sighed and invited the young man to sit down and have some dinner.

Joseph Reder, the stowaway, has a chat with a passenger, Sir Harry Brittain, K.B.E. (*Photo W. J. Makin.*)

He revealed himself as an Austrian, Joseph Reder, aged 24, who had thought out an invention which would revolutionise flying. Two friends, to whom he had confided the secret, had proceeded to Germany with the plans, but young Reder, having misgivings about their honesty, decided to follow them. He wired home for passage money, but tired of waiting for its arrival decided to get home by hook or by crook.

After being kept under lock and key the young stowaway was given a free but legitimate flight back to M'Byea. On arriving back here he was handed over to the local police officer, who took him off to a stone doorway and ushered him through. Reder, after the brilliant sunshine, blinked in the gloom, and found himself in the bar of the only hotel within 300 miles. The officer perched himself on a stool indicating another to his prisoner. "What'll you have?" he inquired. "Brandy and soda, thanks" replied the prisoner. The drinks were produced. "As soon as we have had this night-cap" resumed the officer "we'll be getting along to the gaol. It's not a bad place, you can come in and go out as you please, but remember, no stowing away in aeroplanes. The magistrate will hear your case in a week's time."

The stowaway nodded, grinned and drained his glass; half an hour later officer and prisoner were on their way to the gaol.

"A great pity," sighed the barman, "a sum of money was wirelessed here for that boy three hours after he had left in the aeroplane."

Civil Aircraft at Baldonnel

IT is understood that the Irish Free State Department of Defence are likely to prohibit the use of Baldonnel aerodrome, County Dublin, the headquarters of the Army Air Corps, to civil aircraft in the near future. This matter has been under consideration on several occasions, and now that a civil aerodrome is available at Kildonan, Finglas, near Dublin, it is understood that the Government have decided on definite action. The Irish Aero Club house their machines and carry out all their flying at Baldonnel, and it is now likely that they will have to transfer their headquarters to Kildonan, since no other aerodrome is available near the city. Iona National Airways, Ltd., operate at Kildonan aerodrome, for which they hold the licence. It is situated about four miles north-west of Dublin, and Customs facilities are available. The Army Air Corps is, it is understood, to undertake an extensive training programme during the summer, and several improvements are to be made at Baldonnel very shortly under a special grant for constructional work.

A few Avro "Tutors" ready for delivery on Woodford aerodrome after flight testing. (FLIGHT *Photo.*)

Approaching an Ideal

Large orders, coupled with close attention to detail design, are necessary if production methods are to be achieved in Aircraft Manufacture. The Air Ministry's order for Avro "Tutor" training machines has enabled much hand-work to be eliminated and economical production methods to be used.

MANY years ago building an aeroplane was a skilled carpenter's job. In some cases even the designer had a comparatively small say in the machine, and much of his work was done with chalk on the workshop floor as the aeroplane progressed. "Fit on job" was the standard order in those days, and armed with an abundance of bamboo, light timber, cord, wire and glue, the carpenter gradually built up a machine as near to his employer's desires as he could.

Then the war came and interchangeability was vital, It was necessary to ensure that spare parts sent to France would fit any aircraft of the type. So gradually the drawing office technique was improved and drawings were produced to which the workmen had to adhere. This in turn led to the simplification of the structure and its details, for no longer was it possible to allocate one man to one aircraft. Men who had never seen an aeroplane now had to build them in hundreds as fast as they could. Very soon fittings and the like were so designed that they could be used in more than one place on the same machine, and in this way the number of different parts required was decreased, but it was possible to increase the number of each part ordered at one time. This repetition work was helped by the increasing size of the orders placed for each type, as the war went on, until towards the end, the job tickets in the works called for hundreds of each part.

To many industries even numbers of this size are negligible, and are not looked upon as worthy of being classed as "production jobs." The aircraft trade was, however, and for that matter still is, in its infancy, so this was the first time that economical repetition methods had been possible.

After the war, things, as everyone knows, stagnated for a long time, but designers were constantly busy searching for means to cheapen production. During the war it had not mattered very much what things cost, it was the Government that was paying, but when peace and sanity

The fuselage assembly line. The advantages of the trolley system, described in our article, are clearly shown here.

A view of the wing assembly shop. A large quantity can be handled economically and fast by this method.

returned and Civil Aviation had to "pay for itself," it was no longer possible to use wasteful and expensive methods.

After a few years the countries whose climates are far from being equable found that wood was by no means an ideal substance from which to build aeroplanes, and so a demand for metal aircraft grew up. Some manufacturers turned to steel, others to light alloys, while others used a combination of both.

Naturally a revolutionary step of this nature brought in its train many critics. All these critics were, however, eventually confuted, and today all-metal aircraft are a standard production.

Works and production managers were quick to realise the advantages of metal, and before long we found presses installed to stamp out blanks or finished parts, wherever possible. By this method the cost of parts was brought down, and today it is standard practice to "tool up" for a certain type as soon as the size of the order warrants the expenditure on jigs and dies.

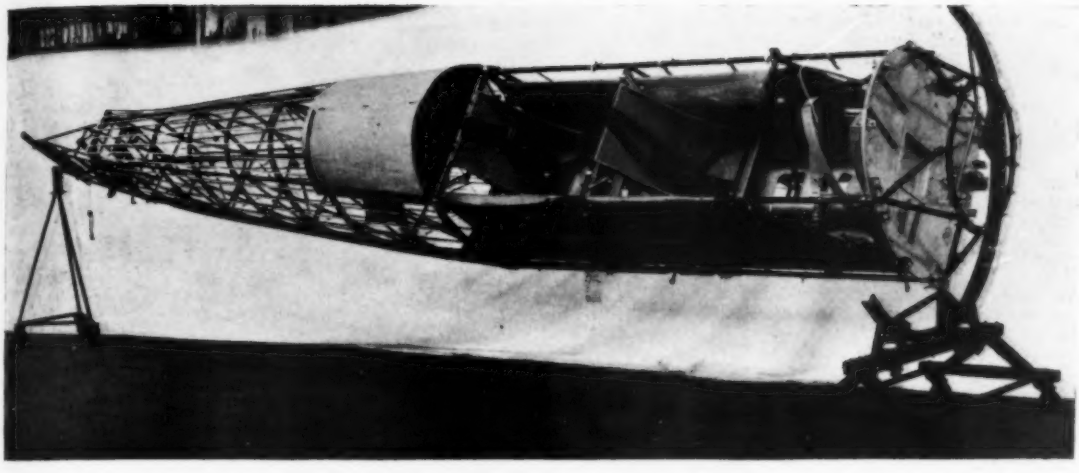
A. V. Roe & Co., Ltd., were one of the first aircraft manufacturers in this country to take up the welded steel tube type of construction. Anthony Fokker was the pioneer of this method of building aeroplanes, but for many years our Air Ministry would not sanction the use of welded joints for stressed components unless elaborate methods of strapping and pinning the joints were also used. The technique of welding has, however, greatly improved now, as has the production of a steel which still retains a reasonable strength after welding and does not become unduly hard or brittle afterwards. D.T.D. 89a is the specification now used by Avro's, and its properties are so good that in almost all cases plain butted joints are used without internal sleeves or external straps.

This welded form of fuselage is now standard practice at Avro's. In most cases the front half is rigidly braced with diagonal tubes, while the rear half has double piano wire bracing from small loops of tube welded into the corners of each bay, tensioned with strainers. This is how the "Tutor" is being built for the Air Ministry, who have recently standardised the type for training in the Royal Air Force.

The production of this fuselage is really quite a simple matter. Each side of both the front and rear halves is first of all welded up on a flat, steel-covered, jig table. Then each pair of half sides is erected in a vertical jig so that the bracing tubes, athwartships or diagonal as the case may be, can be welded in, resulting in two complete half fuselages. These halves are then put into further jigs, which have blocks with holes in them registering against the tubes at all points where holes have to be drilled. It is then an easy matter to secure absolute interchangeability by drilling the tubes through the holes in the blocks. A final jig is now used to assemble the front and rear halves together into a complete fuselage. During the processes we have just run through, other small structures necessary to complete the fuselage, have been welded up in their own individual jigs, and these are now drawn from store and welded in. There are also many plates and lugs for holding equipment, and all these go on in this last jig.

A "Tutor" rib blank, ready for the flanging press. By having strip metal supplied to size there is very little waste when stamping out these blanks.

After the fuselages leave this last jig in the welding shop they are transferred to the erection shop, where they are bolted into an interesting type of erecting cradle. This cradle is in the form of two trolleys on fully castored wheels, so that it can be pushed about wherever it is wanted. The one at the front has lugs which take the fittings on to which the engine mounting is ultimately bolted, and these lugs are on a vertical hoop of angle-iron, so fitted between rollers that it can be rotated through considerable angles, the rollers being on a base which carries the trolley wheels. The trolley carrying the rear end of the fuselage is a pyramid, carrying at its head a dummy stern post which is rotatable in a vertical plane about a horizontal shaft. This dummy stern post is simply clamped on to the tail of the fuselage in place of the real stern post. The result is that the fuselage is carried at a reasonable waist height in



A " Tutor " fuselage on the assembling trolleys showing how it can be held at any angle so as to expedite the work as much as possible. (FLIGHT *Photo.*)

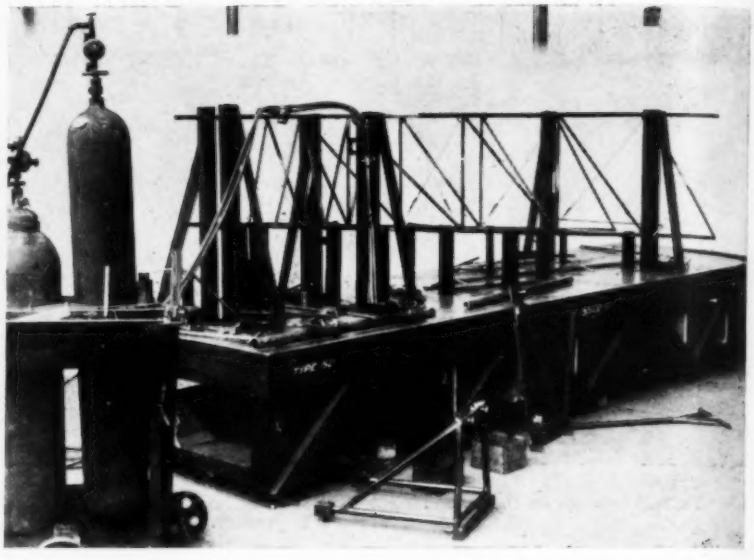
such a manner that it can be pushed about quite easily and also rotated on its longitudinal axis. The advantages of this are very considerable, and greatly facilitate the fitting of the various sub-assemblies into the machine.

There are two long lines of these " Tutor " fuselages down the main erecting shop, placed either side of a row of benches carrying the various components, and as each component is fitted the fuselage is pushed along up the line. Near the head of the line we find the linen covering-bag has been fitted, and it is again impressed upon one how advantageous this trolley system is, as it is an easy and speedy matter to haul the covered fuselage out of the line to the doping shop, give it the requisite coating of dope, and then push it back again for further attention. A final stage is the substitution of the machine's own under-carriage for the front trolley, and even then the retention of the tail trolley makes pushing the aircraft about quite an easy operation.

The question of simplification of production has, in the " Tutor," as in all other Avro aircraft, been carefully studied at all times and, wherever possible, complete components are made and assembled before being erected in the machine. It would be quite impossible in the space at our disposal for us to go through the machine from stem to stern, enumerating all the various components and explaining the methods which have been used to simplify their manufacture. There are, however, one or two which are particularly interesting. For example, the flying controls from the front of the front cockpit to the rear of the back cockpit are erected as one separate unit. This is no mean achievement when it is remembered that the " Tutor " has full dual control, with adjustable rudder bars and differential, rudder-bar operated wheel brakes, in each cockpit. This control unit carrying both control columns and rudder bars is in the form of a long, narrow duralumin-covered box, which is bolted direct to the duralumin floor, which is also one complete unit. Another unit arrangement showing ingenuity is the side fairing arrangement.

From the rear cockpit to the bulkhead behind the engine each side of the fuselage is faired with a detachable panel. This panel is built up on a spruce framework and fabric covered. Easily operated clips make it a simple matter to remove it for inspecting the run of cables and pipes between it and the fuselage structure. Incidentally these items are all kept outside the structure so that the inside, which is upholstered, presents a clean and clear aspect to the cockpits ; this is very pleasing when

A drilling jig for the front half of the " Tutor " fuselage. (FLIGHT *Photo.*)



A typical welding jig, in this case for the rear end of the "Tutor" fuselage. (FLIGHT *Photo.*)

compared to the standard aircraft of a few years ago.

The dashboards, complete with all instruments, and the adjustable seats are other units which are completed beforehand ready for bolting into the fuselage. The fuselages, after being finished completely with the Armstrong-Siddeley "Lynx" engine and all its installation, have the top centre section of the wing erected on them, and they are then towed out to Woodford aerodrome some way south of Manchester, ready for erection of the main planes and tail units.

While the fuselage was being built these covered units were also progressing, and they, as well, are made from metal. The main plane spars are interesting, and so designed that they can be turned out quite fast. They are of bulbous I section, built up from high tensile strip steel. The firm have their own draw-bench on which both the bulbous booms and the flat web are drawn. The booms go through a series of rollers which gradually change the flat strip to a many-sided circular section, leaving the two edges of the strip to form lips projecting from the circular portion, for about a quarter of an inch. The web is also a flat strip to start with, but this simply has grooves rolled into it. After these sections have been cut off in the required lengths they are heat treated by electricity in an interesting manner. Each boom or web is clamped between jaws on a bench, somewhat similar to a draw-bench, and then, while under tension, a current of comparatively low voltage but of high amperage is passed through it. This, of course, heats it, and it is allowed to remain heated for a certain length of time, according to the material and whether it is being hardened or tempered. This appears to be a much more economical method than using a muffle furnace or bath, as heat—*i.e.*, current—is only being used while it is actually doing any work, and all the heat generated is used directly on the article being treated.

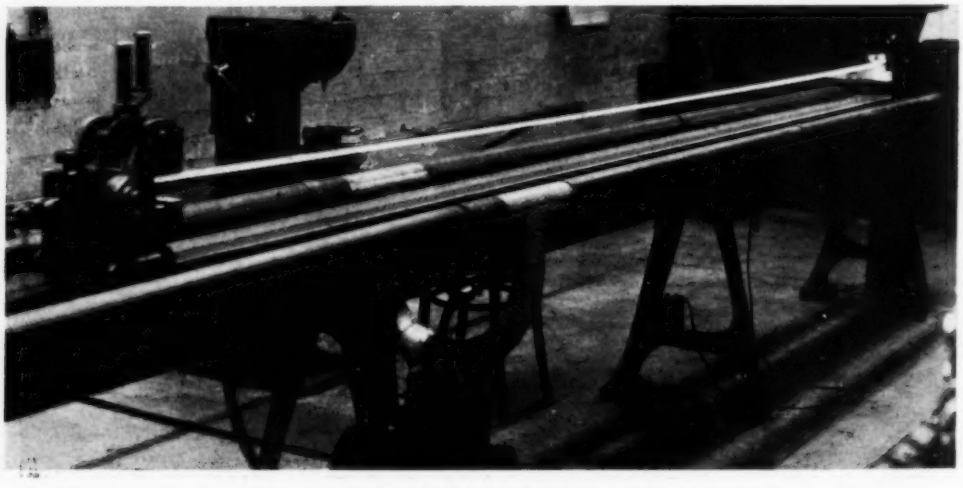
The treated boom and web sections are then put together, the flat web being inserted between the projecting lips of each boom. A piercing machine then makes holes along the lips and the booms and web are riveted together on hand-riveting machines.

The next stage is to drill the spar, and this is done on a jig much in the same way that was used on the fuselage. After this the various fittings are riveted or bolted on and the ribs assembled.

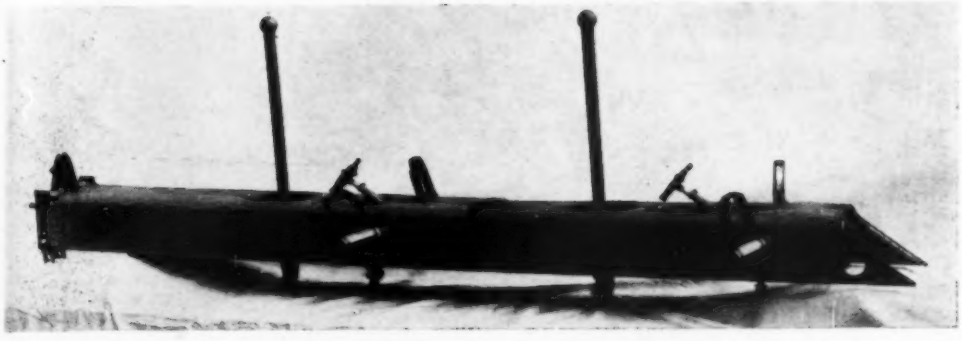
The ribs are stamped out of sheet aluminium and flanged where necessary for strength. In some cases a box rib is used for a compression rib, while in others the streamline wire drag bracing is anchored to fittings at the end of a compression tube.

The wings are fabric covered and doped in the usual way. Their production offers cause for no especial comment and proceeds in the normal manner on flat trestles for assembly.

The tail plane, fin, elevator and rudder are of simple construction, having tubular steel spars or posts, as the case may be, with ribs, leading and trailing edges welded to them. The ribs of the elevator are of flat plate suitably angled, but the other components have small tubes, bent to give the correct section, welded together. The rounded ends of the main planes are formed in the same way and attached to the ends of the built-up spars. All these, like most other parts, are welded up on flat jigs. As one would expect, all these type of jigs are put together in one corner of the main fitting shop, thus forming what might be called a welding shop for small parts. Oxy-acetylene high-pressure gas, it may be added, is used throughout the works.



Careful heat treatment is a vital necessity for high tensile steel strip structures. Here you can see a spar boom heated by electricity for hardening. (FLIGHT *Photo.*)



The simplicity gained by the unit system of construction is shown very clearly indeed by this view of the "Tutor" control unit. (FLIGHT *Photo.*)

for welding, and the cylinders are usually mounted vertically on a small trolley for each welder.

Another part of this shop is confined to sheet metal workers, who turn out the detachable fairings used around the engine bay and the Townend Ring which cowls the "Lynx" engine, together producing an appreciable increase in performance. These fairings are of sheet aluminium, and are all buffed before delivery on the finished "Tutor." The same department also produces the fuel tanks. These are made of sheet aluminium, and shaped according to their position in the machine. Their ends are dished and welded in place. Yet another of the sheet metal workers' activities is making floats, for the "Tutor" is used as a seaplane trainer as well. The floats are of more or less conventional design, riveted throughout and built of duralumin plate. Incidentally every piece is anodically treated to prevent corrosion, as is every other piece of light alloy in the "Tutor." The greatest attention has been paid to this point, and all steel parts are cadmium plated. Finally the whole is heavily varnished so that corrosion is virtually impossible, even under the most trying circumstances.

Parallel to one side of the fitting shop runs the machine shop and tool room, and here, besides the stampings, all the machined parts are made. Considerable use is made of turned or other machined parts in the "Tutor," and much weight has been saved by the careful design of such items.

Down at the aerodrome the main planes and tail units are erected on the fuselage, and each "Tutor" is test flown before being passed out as fit for delivery. Some are flown away, but some are not, and these latter are dismantled, sent back to Manchester and painted before being boxed up and sent off by train.

Enterprise at the Royal Aero Club

FOR the entertainment of the members of the Royal Aero Club a film show was held at 119, Piccadilly, on April 12. This was the second show of its kind and will be followed by others when suitable films become available. On Wednesday the display started with films of the Schneider Trophy Contest of 1931 and Flt. Lt. Stainforth's high-speed record flight immediately following the contest. There were some excellent views of a fleet of Mr. Hubert Scott-Paine's "power" boats doing their trials preparatory to being handed over to the Air Ministry; an interesting series which showed the working of the vertical wind tunnel at Farnborough—this was described in FLIGHT for June 3, 1932, and is used for spinning tests; a "Virginia" being catapulted by means of the compressed-air motor in the same manner as was done during the Royal Air Force Display at Hendon; some views of Imperial Airways' machines going about their lawful business; some really excellent photographs of R.A.F. bombing aircraft taken in Egypt and showing the Pyramids and the Sphinx; an historic film of the great tri-plane flying-boat the Porte "Baby," which had five engines; a record of the visit of the Do.X to Calshot; a record of some early flights of the ill-fated R.101; views taken during the R.A.F. Display at Hendon in 1931; tests of the large six-engined Short flying-boat R6/28, and flights of Mr. Lowe-Wylde's low-powered machines which were the forerunners of the "Drone."

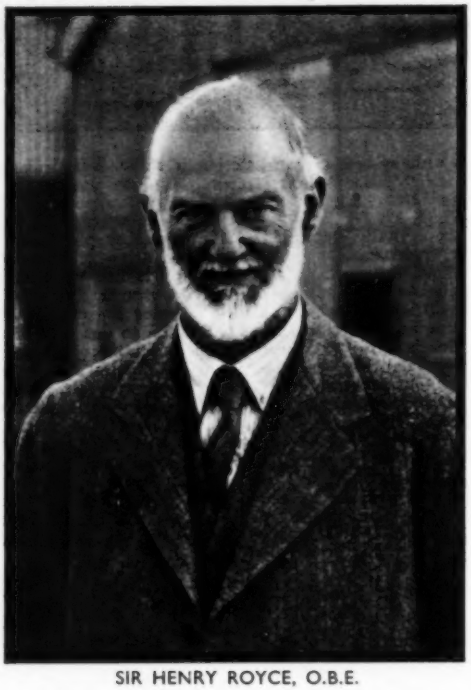
SHIPS OF THE DESERT, OLD AND THE NEW: A single-seater "Camel" and a three-seater Spartan at Omdurman. The Spartan belongs to Mr. Oscar Garden, who is carrying out joyriding flights, etc., in the Sudan and Egypt.

DEATH OF SIR HENRY ROYCE

"Fortis et prudens simul"

WE very much regret to learn of the death of Sir Frederick Henry Royce, Bart., at the age of 70. He died on Saturday, April 22 at his home at West Wittering, near Chichester, after an illness which lasted about six months and was brought about by overwork. He leaves a widow, née Minnie Grace Punt, whom he married in 1893, but no heir, and the baronetcy granted in 1930 becomes extinct.

Sir Henry Royce was the son of a miller in Rutland, who was one of the first millers in the country to instal steam engines in his water mills. The future baronet started work as a telegraph boy. Then he went through a technical college, served a few years in the locomotive works of the Great Northern Railway at Peterborough, and then entered an engineering works at Leeds. At the age of 21 he started his own business in Manchester, making arc lamps and dynamos, but when a slump occurred in this business after the South African war, he began to turn his attention to motor-cars. It is said that he bought a foreign motor-car, but was so disgusted with its performance that he decided to design a car engine for himself, and in 1903 produced a 10-h.p. model.



SIR HENRY ROYCE, O.B.E.

It was this first Royce car which attracted the attention of the Hon. C. S. Rolls, and the two men joined forces. In 1906, the firm of Rolls Royce, Ltd., was formed with a capital of £200,000, and works were established at Derby. Royce was the chief designer, and Rolls was the demonstrator and, so to speak, the chief salesman. About this time the late Mr. Claude Johnson joined the firm, and, with his great organising ability, provided the business brains of the undertaking. The partnership of the two men who gave their names to the firm was all too brief. Rolls achieved fame as an air pilot, and in 1910 was killed in a crash at a flying meeting at Bournemouth. The flying tragedies of those days came all too thick and fast.

It was not until the great war that the firm of Rolls Royce turned their attention to aero engines. During the war they produced the 75-h.p. "Hawk," which was used in non-rigid airships; the 275-h.p. "Falcon," which survived for very many years as the engine of the Bristol "Fighter" and only finally left the service of the R.A.F. last year, when No. 6 (Bomber) Squadron was re-equipped with "Gordons"; and the 360-h.p. "Eagle." There were two "Eagles" in the "Vimy" in which Alcock and Whitten Brown made the first non-stop flight across the Atlantic. Later came the 650-h.p. "Condor." In 1928 a new era in aero engines was ushered in by the production of the "F." and "H." types, now known as the "Kestrel" and the "Buzzard." From the "Buzzard" came the development of the "R." or racing engine, which was used in the Schneider winners of 1929 and 1931, and with which two successive world's speed records in the air were established. Following the British victory in 1929, a baronetcy was conferred on Mr. Royce.

Sir Henry Royce's ideals were perfection in everything and unremitting hard work. The approach of age never dulled the keenness of his brain. He had collected round him a band of brilliant designers, but he kept his own drawing office staff at West Wittering, and he personally scrutinised every detail of every new product of his firm. Sir Henry shunned publicity, and few outside his firm knew much of his personality. In these days such modesty is especially admirable and rare.

To Lady Royce we beg to offer our deep sympathy.

A Message of Sympathy

Lord Londonderry, Secretary of State for Air, has sent the following message of sympathy to the Managing Director of Rolls-Royce, Ltd.:—

"On behalf of the Air Council I desire to express our profound regret at the death of Sir Henry Royce and the termination of his long and distinguished association with the work of the Air Ministry in peace and war. His death will be a serious loss to British aviation as well as to his firm, to whom I wish to convey our sincere sympathy."

S S S S S S

Rotating Wings

IF the anticipations of Capt. Victor Dibovsky, the Director of Helicopter, Ltd., 106, High Street, Camden Town, London, N.W.1, materialise, we shall see a flying machine capable of rising vertically and of using very considerably less horse-power to maintain itself in the air than is at present needed. Capt. Dibovsky will be remembered for many inventions which have already assisted the progress of flying. One of his more important ones, though hardly an advance in flying, was the interrupter gear which made it possible to fire machine guns through the propeller during the war. In his laboratory he is now able to demonstrate large working models incorporating his Helicopter principle, which lift themselves into the air and sustain themselves in this position, requiring only very small power to do so. He is at present looking for capital with which to build a full-size flying machine, which he hopes will not only be able to rise vertically from the ground and progress horizontally through the air, but will also be capable of propulsion both on the water and on the land. It will therefore in effect be a motor boat, motor car and flying machine. His principle entails the use of two pairs of rotating blades which revolve in opposite directions, and he has produced a form of gear which enables one motor to drive both blades. He also claims that in the event of engine failure it will be easy so to adjust the blades, that they continue rotating and allow the machine to sink as gently as is desired. This, if it can be accomplished, will automatically remove one of the chief disadvantages of the helicopter, as so far evolved by other inventors. Directional control, another difficulty in previous helicopters, is to be obtained by braking one of the rotor systems and using the torque to turn the machine.

Postponement

THE dinner arranged by the Junior Aero Club to honour Sqd. Ldr. O. R. Gayford and Flt. Lt. G. E. Nicholetts which was to have taken place on April 28 has had to be postponed owing to the fact that these two officers will not now be back in England until early in May.

The AIRCRAFT ENGINEER

FLIGHT ENGINEERING SECTION

Edited by C. M. POULSEN

April 27, 1933

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MOMENTS OF INERTIA.

By E. H. Atkin, B.Sc.(Lond.).

There is more than one method of determining graphically the moment of inertia of the cross-section of a beam, but, in spite of this, the writer ventures to describe yet another. While the method he will put forward in this note does not pretend to be entirely new, it does not appear to figure in the standard text-books. In addition, it evinces advantages over at least one of the older methods. This fact in itself should appeal to those of us who are not fortunate enough to be able to find all the sections they require, tabulated in the excellent handbooks of Messrs. Dorman & Long, or Redpath Brown.

It will be observed by those well versed in these things that the procedure depends for its proof on a well-known theorem in mathematics.

In spite of this, to most readers, the method should, besides its other recommendations, constitute an interesting mathematical departure from the older methods.

The method has for its practical basis the idea in the theory of beams of successive integration or summation used in constructing the shear and bending moment diagrams from the loading diagram.

So far as the "shear" diagram goes the analogy is perfect, but it breaks down in the next stage.

The reader is referred to Fig. 1. Stated formally, the determination of the moment of inertia of the figure A, about the axis XX, is the mathematical problem of evaluating the integral $\int x^2y\,dx$ over the entire area. This is easily seen to be true: for the element of area distant x from XX is $y\delta x$, its moment of inertia is $x^2y\delta x$ and I_{XX}, the moment of inertia of the entire area is the sum of all such elements, thus:—

$$I_{XX} = \Sigma x^2 y \delta x$$

which in the limit becomes

$$I_{XX} = \int x^2 y\,dx \quad \ldots\ldots\ldots \quad (A)$$

This integral may be transformed into the required form by at least two methods. The more pedestrian one will be described first:—

First Method.

We may integrate $\int x^2y\,dx$ by parts as follows:—

Put $x^2 = u$

and $y\,dx = dv$ in the usual formula

whence $2x\,dx = du$

and $v = \int y\,dx$

therefore $\int x^2y\,dx = x^2\int y\,d - 2\int\left[\int y\,dx\right]x\,dx$

$$= x^2\int y\,dx - 2\iint xy\,dx\,dx \quad \ldots \quad (1)$$

Now consider $\iint xy\,dx\,dx$: integrating by parts as before,

Put $x = u$

and $\int y\,dx\,dx = dv$

whence $dx = du$

and $\iint y\,dx\,dx = v$

therefore $\iint xy\,dx = x\iint y\,dx\,dx - \int\left[\iint y\,dx\,dx\right]dx$

$$= x\iint y\,dx\,dx - \iiint y\,dx\,dx\,dx \quad \ldots (11)$$

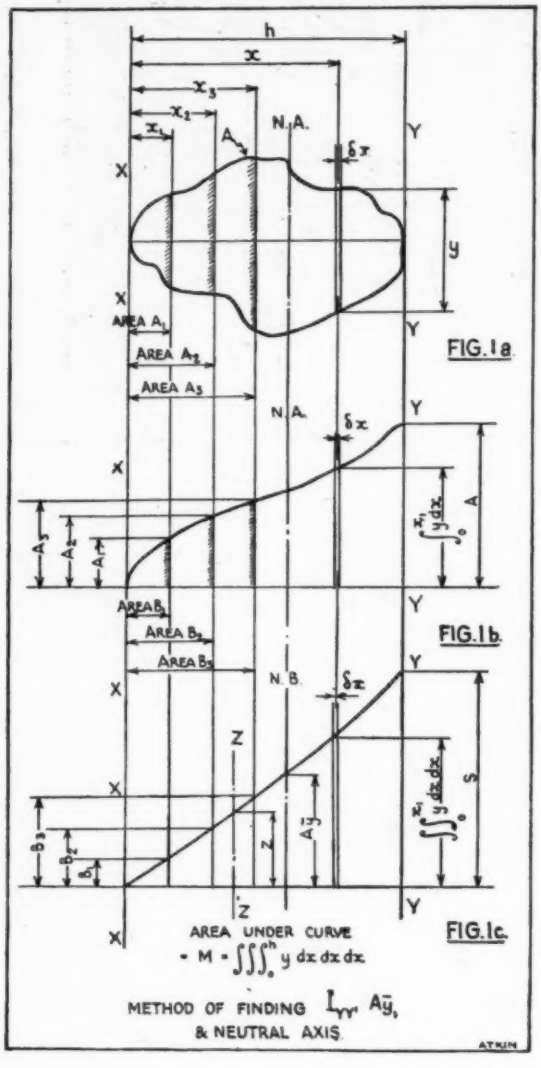
Substituting this value for $\int x\,y\,dx$ in $\iint x\,y\,dx\,dx$, (1) becomes

$$x^2 \int y\,dx - 2x\iint y\,dx\,dx + 2\iiint y\,dx\,dx\,dx$$

On examining this expression we observe that:—

(*a*) $\int y\,dx$ is simply the area of the cross-section. We shall, therefore, denote this quantity by A.

(*b*) $\iint y\,dx\,dx$ is the area under the "shear" curve derived from the original figure in the same way that a shear curve is obtained by integrating the loading curve of a beam. To sustain the analogy we shall put S for this quantity.



(*c*) $\iiint y\,dx\,dx\,dx$ bears the same relation to $\iint y\,dx$ that $\iint y\,dx\,dx$ does to $\int y\,dx$. For shortness we shall use M for this quantity.

The introduction of the limits of integration will, in addition, give the "x's" outside the integral signs the value h. (The lower limit is zero by construction.)

It may be useful to some if this process is described in more detail.

Fig. 1 (*a*) shows the section whose moment of inertia is to be determined. The partial areas A_1, A_2, A_3, etc., of Fig. 1 (*a*) reckoned from the axis XX to the ordinates distant x_1, x_2, x_3, etc., from XX, are plotted as ordinates distant x_1, x_2, x_3 from XX on the base of Fig. 1 (*b*). The curve so obtained is the curve of $\int_o^x y\,dx$, and the area under this curve is the value of $\iint_o^h y\,dx\,dx$.

We now repeat the above process starting from Fig. 1 (*b*), and, on plotting the partial areas B_1, B_2, B_3, etc. (reckoned from XX to x_1, x_2, x_3, etc., respectively as before) against x_1, x_2, x_3, etc., obtain the curve shown in Fig. 1 (*c*).

This is the curve of $\iint_o^x y\,dx\,dx$ and the area under it is $\iiint_o^h y\,dx\,dx\,dx$.

Thus all the quantities needful are found.

Hence we shall write

$$I_{XX} = Ah^2 - 2Sh + 2M \quad . \quad . \quad . \quad . \quad (B)$$

The first moment of the area can also be found in terms of A and S.

To do this we have to consider the integral $\int x\,y\,dx$.

put $x = u$

and $y\,dx = dv$

whence $dx = du$

and $\int y\,dx = v$

so that $\int x\,y\,dx = x\int y\,dx - \iint y\,dx\,dx$ and, therefore, in our notation

$$M_{XX} = \int x\,y\,dx = hA - S \quad . \quad . \quad . \quad . \quad (C)$$

(B) and (C) are our basic formulæ.

From (C) the distance of the neutral axis from XX is given by

$$\bar{x} = h - \frac{S}{A}$$

i.e., the distance of the neutral axis from the axis YY on the other extreme fibre is

$$\bar{x}^1 = \frac{S}{A} \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad (D)$$

This is the well-known formula of beam theory expressed in terms of different quantities.

From (B) can be deduced a very interesting result.

Using a well-known formula we at once obtain the moment of inertia about YY in the following form

$$I_{YY} = Ah^2 - 2Sh + 2M - A\bar{x}^2 + A\bar{x}^{1^2}$$

Now put $h = \bar{x} + \bar{x}^1$ and $\bar{x}^1 = \frac{S}{A}$

$$\therefore\ I_{YY} = A\left(\bar{x} + \frac{S}{A}\right)^2 - 2S\left(\bar{x} + \frac{S}{A}\right) + 2M - A\bar{x}^2 + A.\frac{S^2}{A^2}$$

which on simplifying $= \underline{2M} \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad (E)$

i.e., I_{YY} is equal to twice the area under the "moment curve" constructed by integrating from the opposite end XX.

2nd Method.

The following compact proof of (E) will appeal to those acquainted with the theory of operators.

The extended form of Leibnitz' theorem gives at once the following equation

$$\frac{yx^m}{D} = x^m\frac{y}{D} - Mx^{m-1}\frac{y}{D^2} + x^{m-1}\frac{m(M-1)\,y}{D^3} - x^{m-2}\,m\,(m-1)\,(m-2)\,\frac{y}{D^4}, \text{ etc.}$$

where D is the differential operator $\frac{d}{dx}$

Apply this relationship to the following integral :—

$$I_{YY} = \int_o^h y\,(h-x)^2\,dx$$

$$= \int_o^h \frac{y}{D}(h^2 - 2hx + x^2)$$

$$= \left[h^2\,D^{-y} - 2h\left(x\frac{y}{D} - \frac{y}{D^2}\right) + \left(x^2\frac{y}{D} - 2x\,\frac{y}{D^2} + 2\,\frac{y}{D^3}\right)\right]$$

which after some little simplification $= \underline{2M}$

It will be noted that all these formulæ achieve their simplicity from the limits of integration. The axes XX and YY must be at the extreme fibres of the section, otherwise the final formulæ will be more complicated.

The moment of inertia is sometimes called the "second moment," from the fact that each element of area is multiplied by the *square* of its distance from the axis of reference. Generalizing this definition the "m th" moment is defined as the sum of all particles multiplied by the m th powers of their respective distances from the axis of reference.

The interested reader will find it good practice to prove that the "m th" moment about YY is given by the formula

$$\overline{\underline{\quad}}_m = \int_o^h y\,(h-x)^m\,dx = m\,!\,\Big|_o^h \frac{y}{D^{m+1}}$$

where $\Big|_o^h$ *indicates the substitution of the limits* in the *result of integration in terms of* $\int y\,dx$, $\iint y\,dx\,dx$ *etc.*

As this formula is of no practical interest to the engineer for values of $m > 2$ we shall leave the subject here.

One important advantage of the theory will however be noticed before we proceed to an example.

In many cases the value $A\bar{x}$, *i.e.*, the moment of area of the part to one side of neutral axis or any other axis in the section about that axis is required in order to calculate the shear stresses in the section.

This quantity can be immediately read off from the moment curve (or curve of $\iint y\,dx$). For instance, in Fig. 1c Z is equal to the moment of area of the original section on the side of ZZ on which the various integrations start, viz., between XX and ZZ.

To conclude now with the example :—

Fig. 2 shows a typical section, the properties of which are required.

Ordinates 1, 2, 3, etc., are drawn across the section at an appropriate spacing.

It will be noticed that these ordinates are spaced closest together where the width of the section (measured parallel to XX) is varying most rapidly.

The section will be integrated from the axis XX.

The partial areas measured from XX to the ordinates 1, 2, 3, etc., respectively are as follows :—

TABLE No. 1

Section measured	$A = \int_o^x y\,dx$
Axis XX to Ord. No. 1 ...	0·1
" " " No. 2 ...	0·68
" " " No. 3 ...	0·73
" " " No. 4 ...	0·95
" " " No. 5 ...	—
" " " No. 6 ...	—
" " " No. 7 ...	1·75
" " " No. 8 ...	1·92
" " " No. 9 ...	2·01
" " " No. 10 ...	2·72
" " " No. 11 ...	2·75

The areas A in Table 1 are plotted to give the curve in Fig. 2*b*.

The area under this curve is the value of S $\left(\text{or} \int\int_o^h y\,dx\,dx\right)$.

S = 5·39 in.³. (*See* Table 2 below.)

The partial areas under this curve measured from XX to ordinates 1, 2, 3, etc., respectively, are tabulated below.

The areas B in Table 2 are plotted to give the curve in Fig. 2*c*, and the area under this curve is the value of M $\left(\text{or} \int\int\int_o^h y\,dx\,dx\,dx\right)$.

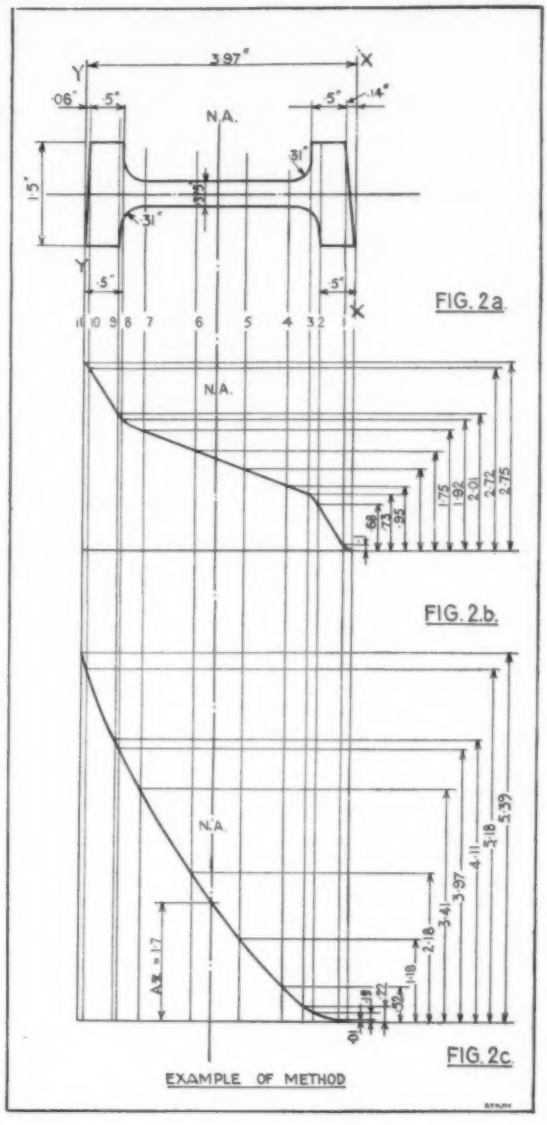


TABLE No. 2

Section measured	$B = \int\int_o^x y\,dx\,dx$
Axis XX to Ord. No. 1 ...	0·01
" " " No. 2 ...	0·15
" " " No. 3 ...	0·22
" " " No. 4 ...	0·52
" " " No. 5 ...	1·18
" " " No. 6 ...	2·18
" " " No. 7 ...	3·41
" " " No. 8 ...	3·97
" " " No. 9 ...	4·11
" " " No. 10 ...	5·18
" " " No. 11 ...	5·39

It is found that M = 7·76 in.⁴

Immediately $I_{YY} = 2\,M_{XX}$

= 15·52 in.⁴

Distance of neutral axis

$$\text{from YY} = \frac{S_{XX}}{A} = \frac{5 \cdot 39}{2 \cdot 75}$$

$$\therefore \quad \bar{x}' = \underline{1 \cdot 96 \text{ in.}}$$

Hence, I about N.A. $= I_{YY} - A\bar{x}'^2$

$$= 15 \cdot 52 - 1 \cdot 96^2 \times 2 \cdot 75$$

$$= \underline{4 \cdot 95 \text{ in.}^4}$$

And the height of the curve in Fig. 2c at the N.A. is

So that

$$A\bar{x} = \underline{1 \cdot 70 \text{ in.}^3}$$

Summarising our results, we have

$$A = 2 \cdot 75 \text{ in.}^2$$

$$A\bar{x} = \underline{1 \cdot 70 \text{ in.}^3}$$

$$I_{NA} = \underline{4 \cdot 95 \text{ in.}^4}$$

The method of this article has the advantage that the scales of the successive figures can be adjusted to give a reasonably accurate result. This is not so in the case of the "polar method," because each derived figure is smaller than the one from which it is constructed. Hence it is difficult, unless the figures are drawn to an inconveniently large scale, to obtain accurate values for the various quantities required.

For most of the irregular sections used in engineering, the method of "cubing the ordinates," or the method described above, is decidedly more accurate than the "polar method," and the "cubed ordinates" method does not give the neutral axis or $A\bar{x}$.

DECALAGE AND STRUCTURAL STRENGTH ASSUMPTIONS

By J. H. CROWE, M.Sc.

Decalage may be arranged in two different ways: firstly, the wing sections of upper and lower planes may be the same, but the chords of the sections may be set at some small angle—this may be termed geometrical decalage; and, secondly, the chords may be parallel, but the wing sections may have different no lift angles; this may be called aerodynamic decalage. The term aerodynamic decalage, however, defined as the angle that the no lift angle of the upper plane makes with the no lift angle of the lower plane, positive when the upper plane is at greater incidence than the lower, includes the two, and decalage will be used in that sense here.

There is very little aerodynamic advantage in decalage. Combined with a large forward stagger, it may convert a rather large negative tail load at top speed into a less negative or even a positive tail load thereby slightly increasing the overall aerodynamic efficiency, but it will not convert an aircraft having inherent longitudinal static instability into a stable machine. There should be no appreciable drop in performance with a reasonable degree of decalage, and more than a reasonable degree is obviously inadmissible from a structural strength point of view.

The use of decalage means fundamental differences in stressing assumptions, involving as it does a complete alteration of plane loading ratio. Before dealing with the plane loading ratio, it will be as well to summarise the results of using 2° of decalage with 24° stagger on a typical machine.

(1) Using R.A.F. 31 section, which has a K_{m_0} of $-0 \cdot 029$, the tail load will be decreased by about 30 per cent. This is a distinct gain from a point of view of the fuselage structure. An expression is arrived at for the K_M about the C.G. at no lift which should show very rapidly the decrease in tail load to be expected under any conditions.

(2) The load on the lower front spar in a terminal nose dive may be increased by about 70 per cent., the load on the upper front spar being relieved to a similar amount. The load on the upper rear spar is slightly heavier (the direction of the increase, of course, being the same as for the front spars), but as the terminal nose dive case does not usually provide a criterion for the strength of the rear spars, this is immaterial. The load taken by the front upper and lower spars can therefore be adjusted within wide limits by only a very small degree of decalage.

(3) As far as C.P.B. loading on the rear spars is concerned, the difference is not as great as would be expected. This is accounted for by the fact that as the K_L on the upper plane is increased due to decalage, so the C.P. moves forward, these effects neutralising one another. The maximum decrease on the lower rear spar, however, may be as great as 10 per cent. without a corresponding increase on the top spar.

(4) As the characteristics of the separate planes of a biplane are to some extent uncertain in the region of the stall, it is customary to neglect the effect of plane loading ratio on C.P. positions, and simply to assume that the C.P. of each plane is in its most forward position. Although this effect on C.P. position would be greater in the case of a machine having decalage since the separate lift curves are then further apart, it would nevertheless seem reasonable to make the same assumption as for the normal machine, that is to say, based on the furthest forward C.P. positions and as far as plane loading ratio, as affecting simply the load distribution between the planes, is concerned, this is a point which is best left to individual discretion. We may therefore dismiss the C.P.F. case altogether.

In deducing the plane loading ratio, it is simpler to measure all angles from no lift. Accordingly, let α_U and α_L be the angles of incidence measured from no lift of the upper and lower planes respectively. Then if δ is the angle of decalage in the sense already defined, we have at once

$$\alpha_U = \alpha_L + \delta \quad \ldots \ldots \ldots \ldots \ldots \quad (1)$$

We shall denote the K_L's of the upper and lower planes by K_{L_U} and K_{L_L} respectively, and the mean K_L of the biplane by $\overline{K}_L$. Taking the datum from which all angles will be measured as the no lift line of the lower plane, we may assume $\overline{K}_L$ to be represented by the straight line.

$$\overline{K}_L = \bar{a}\,\alpha_L + \beta \quad \ldots \ldots \ldots \ldots \ldots \quad (2)$$

and the K_L's of the separate planes of the biplane combination to be represented by

$$\left.\begin{aligned} K_{L_U} &= a_U\,\alpha_U = a_U\,(\alpha_L + \delta) \\ K_{L_L} &= a_L\,\alpha_L \end{aligned}\right\} \quad \ldots \ldots \ldots \quad (3)$$

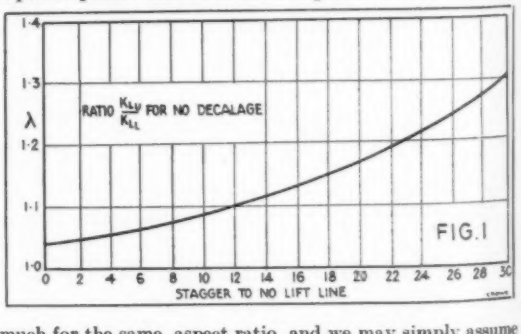
If the total area of the main planes is S and the suffixes U and L have the usual significance, then the fact that $\overline{K}_L$ is a mean K_L is represented by

$$S\overline{K}_L = S_U\,K_{L_U} + S_L\,K_{L_L}$$

and substitution from equations (3) gives

$$\overline{K}_L = \left(\frac{S_U\,a_U + S_L\,a_L}{S}\right)\alpha_L + \frac{S_U}{S}\,a_U\,\delta \quad \ldots \ldots \quad (4)$$

One of the assumptions we make is that $\bar{a}$ is known. This is justified by the fact that the slopes of the K_L curves of the separate planes considered as monoplanes cannot vary very much for the same aspect ratio, and we may simply assume a mean figure for a fictitious monoplane curve and correct it in the ordinary way for aspect ratio and stagger. Alternatively, we may take the slope of a fictitious monoplane curve of infinite aspect ratio as π and correct this to the requisite aspect ratio.



The other assumption necessary is as regards the ratio $\frac{a_U}{a_L}$ which we shall call λ. In the absence of any definite data we shall assume that the relative slopes of the two K_L curves, that is λ, does not change for different degrees of decalage, or that we can take the value of λ deduced from model tests with zero decalage as applicable to the present case. Values of λ deduced from R. and M.'s 857 and 774 are plotted in Fig. 1.

The ratio between a_U and a_L, together with the value of $\bar{a}$ from equations (2) and (4), give us two relations between a_U and a_L :

$$\left.\begin{aligned} \bar{a} &= \frac{S_U a_U + S_L a_L}{S} \\ \frac{a_U}{a_L} &= \lambda \end{aligned}\right\} \quad \ldots\ldots\ldots \quad (5)$$

These two equations give us as values for a_U and a_L

$$\left.\begin{aligned} a_U &= \frac{\lambda S \bar{a}}{\lambda S_U + S_L} \\ a_L &= \frac{S\bar{a}}{\lambda S_U + S_L} \end{aligned}\right\} \quad \ldots\ldots\ldots \quad (6)$$

Inserting these values in equations (2) and (3) gives

$$\left.\begin{aligned} \bar{K}_L &= \bar{a}\alpha_L + \frac{\lambda S_U \bar{a}\delta}{\lambda S_U + S_L} \\ K_{L_U} &= \frac{\lambda S\bar{a}}{\lambda S_U + S_L}(\alpha_L + \delta) \\ K_{L_L} &= \frac{S\bar{a}}{\lambda S_U + S_L}\alpha_L \end{aligned}\right\} \quad \ldots\ldots \quad (7)$$

The curves are drawn in Fig. 2 for a case which will be considered later on of 24° stagger and $\delta = 2°$. λ is 1·22 from Fig. 1 and $\bar{a}$ has been taken to be 0·038 in degrees. Normally K_{L_U} and K_{L_L} and the plane loading ratio are required in terms of $\bar{K}_L$. Substituting for α_L in the second and third of equations (7) and in

$$\frac{K_{L_U}}{K_{L_L}} = \lambda + \frac{\lambda\delta}{\alpha_L}$$

The following equations are obtained in terms of $\bar{K}_L$:

$$\left.\begin{aligned} K_{L_U} &= \frac{\lambda S}{\lambda S_U + S_L}\left(\bar{K}_L + \bar{a}\delta - \frac{\lambda S_U \bar{a}\delta}{\lambda S_U + S_L}\right) \\ K_{L_L} &= \frac{S}{S_U + S_L}\left(\bar{K}_L - \frac{\lambda S_U \bar{a}\delta}{\lambda S_U + S_L}\right) \\ \frac{K_{L_U}}{K_{L_L}} &= \lambda + \frac{\lambda\delta\bar{a}(\lambda S_U + S_L)}{\bar{K}_L(\lambda S_U + S_L) - \lambda S_U \bar{a}\delta} \end{aligned}\right\} \quad . \quad (8)$$

The third of these equations is of little practical use, however, since in the Terminal Nose Dive case we must know the tail load before we can find $\bar{K}_L$, and the best method of finding the tail load is to consider the moments of each plane separately ; also in both the T.N.D. and the C.P.B. cases we must know the centre of pressure positions of each plane. We shall in what follows require only the first two of equations (8).

In order to find moments about the C.G. we shall adopt the conception of a geometric mean chord defined as the one that divides the gap in the ratio $\frac{S_U}{S_L}$. If the gap is g, its distance from the top plane chord is $\frac{S_L}{S}g$. The stagger ϕ will be defined as the angle that the line joining leading edges of top and bottom planes makes with the no lift line of the bottom plane. The C.G. is at a distance xc behind the leading edge of the mean chord where c is the length of the mean chord. In order to simplify the equations we shall assume that the chords of upper and lower plane are the same and equal to c. If this is not the case it will only mean that the appropriate equations will have to be multiplied by $\frac{C_U}{C}$ and $\frac{C_L}{C}$, but we shall retain for the present S_U and S_L. We shall only take account of the lift moment, but if there is a parasite drag moment or wing drag moment these should be included in the necessary tabulation to find the moment about the C.G.

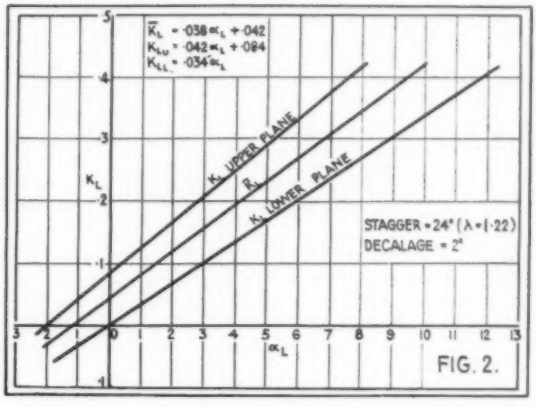


FIG. 2.

The moment about the leading edge of any aerofoil may be expressed as

$$K_m = -mK_L + K_{m_o}$$

We shall take m as being the same for both aerofoils since it does not vary a great deal, and the monoplane value taken must be corrected for gap/chord ratio in the usual manner by multiplying by $\left[1 - \frac{1}{8}\left(\frac{c}{g}\right)^2\right]$. K_{m_o} of upper and lower planes will be denoted by suffixes.

The moment of the upper plane about the leading edge (expressed as a coefficient based on the total area) is then

$$K_{m_U} = \frac{S_U}{S}\left(-mK_{L_U} + K_{m_{o_U}}\right)$$

Since the distance from the leading edge of the upper plane to the leading edge of the mean chord is $\frac{S_L}{S}g\tan\phi$, by transferring the moment to the leading edge of the mean chord we obtain

$$K_{m_U} = \frac{S_U}{S}\left(-mK_{L_U} + K_{m_{o_U}} + K_{L_U}\frac{S_U}{S}\frac{g}{c}\tan\phi\right)$$

And finally transferring the moment to the C.G. and calling moments abut the C.G. K_{M_U}, K_{M_L} and K_M for the total we have

$$K_{M_U} = \frac{S_U}{S}\left(-mK_{L_U} + K_{m_{o_U}} + K_{L_U}\frac{S_U}{S}\frac{g}{c}\tan\phi + K_{L_U}x\right) \quad (9)$$

Similarly for the lower plane where the distance between the leading edge of the lower plane and the leading edge of the mean chord is $g\tan\phi\left(1 - \frac{S_L}{S}\right)$ and the transfer of the moment is now negative, we have

$$K_{M_L} = \frac{S_L}{S}\left(-mK_{L_L} + K_{m_{o_L}} - K_{L_L}\frac{g}{c}\tan\phi\left(1 - \frac{S_L}{S}\right) + K_{L_L}x\right) \quad (10)$$

The total moment K_M is the sum of (9) and (10). Equations (9) and (10) enable us to get out the moment of the lift fairly rapidly when we have tabulated values of K_{L_U} and K_{L_L} for different values of $\bar{K}_L$. Equations (9) and (10) may be combined with equations (8) to give the moment in terms of the mean lift coefficient. In order not to have too cumbersome equations we shall put $S_U = S_L$ and $\frac{g}{c} = 1$. Substituting

from equations (8) then and making this simplification we obtain

$$K_M = \frac{\lambda}{\lambda+1}\left(\overline{K}_L + \bar{a}\,\delta - \frac{\lambda\,\bar{a}\,\delta}{\lambda+1}\right)\left(-m + \frac{\tan\phi}{2} + x\right) + \frac{K_{m_{a_V}}}{2} + \frac{1}{\lambda+1}\left(\overline{K}_L - \frac{\lambda\,\bar{a}\,\delta}{\lambda+1}\right)\left(-m - \frac{\tan\phi}{2} + x\right) + \frac{K_{m_{a_L}}}{2} \quad (11)$$

(To be continued)

IN THE DRAWING OFFICE.

A DRAWING OFFICE PROBLEM

By W. B. COWAN.

WHEN a plane surface cuts across a solid body of ordinary geometrical form, such as a cylinder, cone or sphere, the shape of the line of intersection is readily obtained, the method of procedure being fully explained in the numerous works on "Solid Geometry."

It frequently happens, however, that the body under consideration is not of simple geometric form, and other means of solution must be adopted. This is the type of problem which the aircraft draughtsman has to solve when the true shape of the windscreens of an aeroplane is required.

The two examples following illustrate the method used by the writer to determine the true shape of aeroplane windscreens, though it will be seen that the same principles may be applied to any problem associated with the intersection of a plane surface and a curvilinear body of known shape. The term "buttock lines" which may be unfamiliar to some, is borrowed from the naval architect, and denotes vertical longitudinal sections of the machine.

Fig. 1. Given the front angle and limiting dimensions of a pilot's windscreen, also the shape of the fuselage in its vicinity (the latter will be obtained from the "fuselage fairing lines" drawing), we have all the data necessary for our purpose.

If the spacing of the "buttock lines" *b*1, *b*2, *b*3, etc., on the "lines drawing" is not sufficiently close for accurate working, it will be necessary to draw in intermediate "buttock lines."

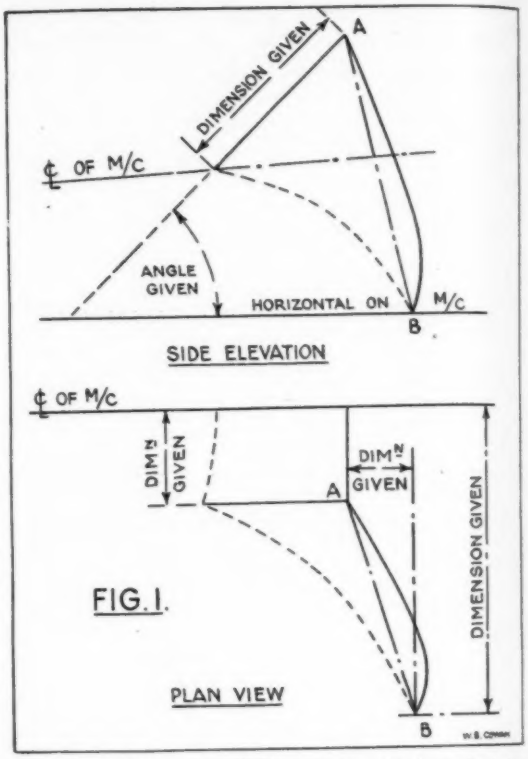


FIG. 1.

The number of buttock lines shown in Fig. 2 should be considered the minimum necessary for accuracy.

Note that although the side panels of a windscreen are usually curved along "AB," this can be assumed to be a straight line at first, and the curvature added after the shape of the lower edge is obtained.

Fig. 2. Dealing first with the centre panel. The shape is obtained by direct projection from the side elevation, and no further comment is needed.

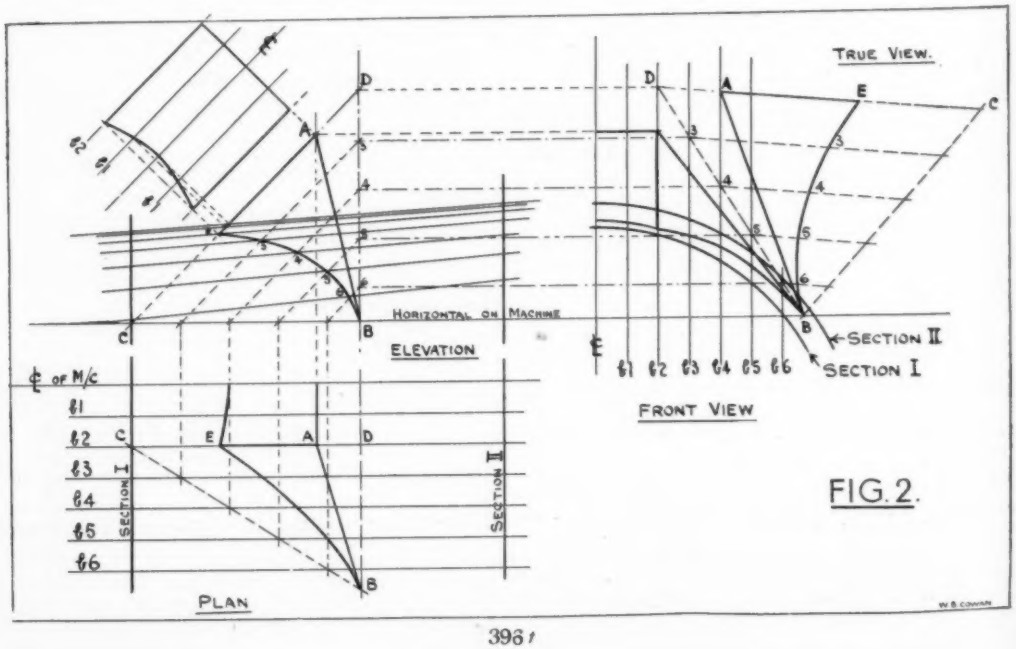


FIG. 2.

Next the side panel. Produce CA until it intersects a vertical line through B. Join C and B in plan view and project on to base line in elevation the points where this line crosses the buttock lines. Draw lines from these points parallel to CD, the intersections of these lines on the buttock lines are points on the curve of the windscreen. It will be observed that the points giving this curve can also be obtained by projecting from the front view the intersections of the buttock lines on BD, and drawing lines parallel to CD as before.

The corresponding curves in plan view and front view are obtained by projecting from the side elevation (the lines of projection are omitted from Fig. 2 for the sake of clearness).

The true view of the side panel is constructed as follows:—From the point D in front view describe an arc of length DC (measured from side elevation) and from B describe an arc of length BC (measured from plan view) cutting the other in C. Join CD and CB. Draw lines from 3, 4, 5 and 6, parallel to DC, then transfer to these lines the lengths DA, DE, 3-3, 4-4, 5-5 and 6-6 (measured from the side elevation). Join A and B and draw a curve through the points E, 3, 4, 5, 6 and B. The figure BAE is the true view of the side panel.

Fig. 3. Here we have a variation of the preceding problem, in this case the centre panel is tapered. This is the form usually adopted for the front portion of the windscreens of a "cabin" aeroplane, in which case the panels would most probably extend to the line DB.

The shape of the centre panel is again obtained by direct projection from the side elevation. For the side panels a horizontal plane through the lower corner B is once more used as a base, but the lines representing the buttock planes are obtained by combining both methods of projection described in the first example, as follows:—

Join C and B in plan view and project on to the base line in elevation the intersections of this line with the buttock lines. Project from the front view the corresponding intersections on BD, and join these points on the side elevation.

Where these lines cross the buttock lines, points are obtained which give the curve of the side panel in side elevation. The corresponding curves in plan view and front view are then derived as before by direct projection from the side elevation. Whilst projecting on to the front view for this curve, continue the lines of projection out to the line BD, in each case, as the points thus obtained are required for the construction of the true view.

The true view can now be constructed by projecting from the plan view. Draw a base line parallel to BC, and project the points B, C and D. From B describe an arc of length BD (measured from front view), cutting the line projected from D; also measure from B, distances equal to B-6, B-5, B-4, B-3 and B-2 (from front view).

From these points draw lines parallel to the base BC and project from the plan view on to these lines the points on the curve. Join DC, project from the plan view the points A and E (E in the example given should coincide with the end of the curve on line 2). Join A and B and the true view is completed.

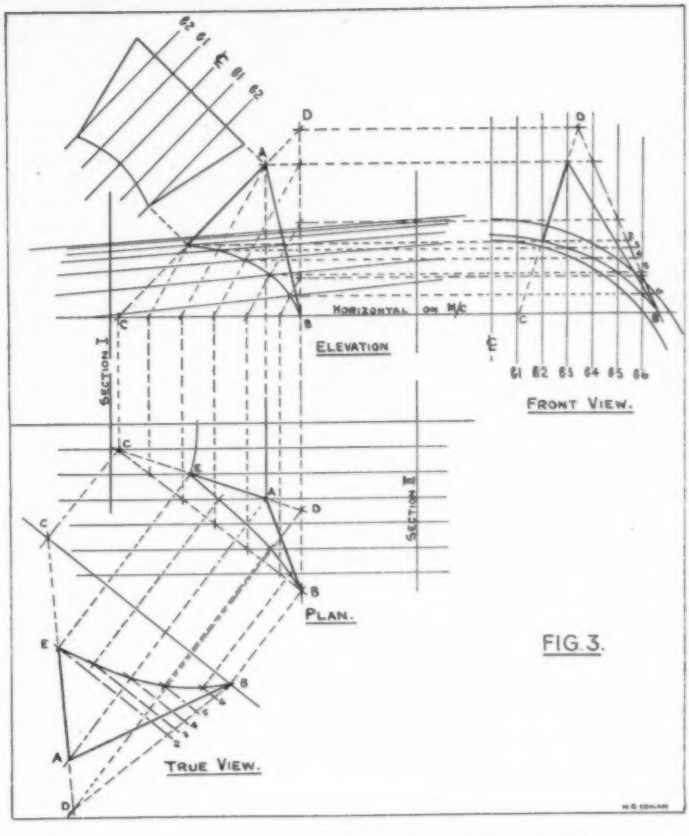


FIG. 3.

TECHNICAL LITERATURE

1932 REPORT OF AMERICAN N.A.C.A.

(*Concluded from page* 24)

Tests in high-speed wind-tunnel.—The results of preliminary investigations in the high-speed wind-tunnel have indicated that airfoils of 2-in. chord may be satisfactorily tested and may be considered as of infinite aspect ratio. The airfoils are built of steel for adequate stiffness and the tests are carried through air velocities up to 96 per cent. of the velocity of sound. Tests of a series of six commonly used propeller sections are now in progress, and the results thus far have indicated large detrimental effects at speeds well below the velocity of sound. A technical report giving the description of the tunnel and an account of this work is in preparation. One result of this investigation that may find immediate application outside the field of propeller design is the indication of an important compressibility effect on the airfoil pitching moment. Pitching moments considerably greater than those for which an airplane is designed may act on the wings in a dive of high velocity. A related series of symmetrical airfoils having systematic changes in their geometrical characteristics is now under construction as part of a more comprehensive study of the compressibility phenomena, to make possible the correlation of aerodynamic characteristics with changes of airfoil shape.

WORK IN THE FULL-SCALE WIND-TUNNEL.—A number of investigations have been made in the full-scale wind tunnel during the year. The aerodynamic characteristics of four different types of airplanes were investigated and compared with the results obtained in flight tests. Satisfactory agreement was obtained, a correction factor for the jet boundary previously deter-

mined from tests of a series of airfoils in a model of the full-scale tunnel being used. Several other airplanes were tested at the request of the Army or Navy to answer specific questions of design.

Several projects may be mentioned as showing the usefulness of the full-scale wind tunnel in answering questions of practical design that have arisen in connection with the work of the military and naval services. At the request of the Army Air Corps the committee investigated the effect on the take-off characteristics of wheel wells in the wing of a Lockheed Altair airplane. The airplane was installed in the full-scale tunnel and the lift and drag measured with the landing gear retracted and extended and with the wheel wells both open and closed when the wheels were extended. The cockpit was covered on one of the tests to ascertain whether the open cockpit affected the drag appreciably. It was found that neither the open wheel wells nor the open cockpit had an appreciable influence on the drag or take-off characteristics.

In connection with the design of a large flying boat (the P3M-1), the committee was requested by the Bureau of Aeronautics, Navy Department, to investigate the cooling characteristics of the engines located in nacelles between the biplane wings and to recommend, if possible, means for reducing the drag of the nacelle. For these tests a complete engine assembly with a stub wing of 14-ft. span was furnished. By an alteration of the tail of the nacelle and the choice of a suitable engine cowling, the drag of the nacelle was appreciably reduced and at the same time satisfactory cooling was obtained.

The Bureau of Aeronautics, Navy Department, also requested an investigation on a Fairchild F-22 airplane to determine the comparative advantages of two wing sections, the N-22 and the N.A.C.A. 2412. It was found that there was practically no difference between the two sections, the principal difference being that the N.A.C.A. 2412 section showed a sharper break in the lift curve at the stall than the N-22.

As a final determination of the jet-boundary corrections for this tunnel, a series of airfoils of the same profile and aspect ratio but of different spans is being tested at air speeds chosen to give the same Reynolds Number for all. The airfoils are of Clark Y section and have spans of 12, 24, 36 and 48 ft. To obtain data on scale effect the tests are being extended to cover a range of Reynolds Numbers from 350,000 to 5,600,000. A marked scale effect on maximum lift is indicated thus far by the tests.

The optimum position of a wing with reference to a fuselage has never been determined for high Reynolds Numbers. At the request of the Army Air Corps, an investigation of this question has been started. A YO-31A airplane with gull wing has been chosen for the investigation. The airplane has been tested, and a mock-up fuselage of the same airplane is under construction to permit testing with the wings in different positions. For some of the tests the gull-wing roots are replaced by a straight center section, permitting the position of the wing to be changed. The programme includes also a thick cantilever wing at the bottom of the fuselage. In addition to the force measurements, pressure-distribution measurements will be made on the wings for each of the various wing positions and also a survey will be made to determine the direction and velocity of the air at all points about the tail surfaces.

SEAPLANES.—The N. A. C. A. tank, or seaplane channel, for the study of hydrodynamic problems connected with aeronautics is now in regular operation. The programme for the tank includes several items of direct interest to the aircraft industry, a number of investigations specifically requested by the Bureau of Aeronautics, Navy Department, and also certain items which may be classed as fundamental information.

Effects of variations in dimensions and form of hull on the take-off of flying boats.—The forms given to the hulls of flying boats differ radically according to the designer and the country. It seems hardly possible that all of the five distinct types, which can be easily recognised, can be of equal merit. The determination of the effect of the form and the dimensions of the hull on the take-off of a flying boat is therefore of immediate interest. In this problem are included not only the resistance to propulsion along the water, but also the attitude assumed and the spray thrown.

The effects of variations in dimensions are being studied by tests of a series of models derived from a common form by systematic variations in dimensions. The effects of variations in fundamental form are being studied by tests of models representing several of the distinct types.

The nature and amount of spray thrown out during the take-off is of special interest. If it is heavy and is thrown into the propellers these may be damaged. If it strikes the wings or other surfaces damage may be done or resistance increased. One of the simpler methods of reducing the spray and changing its direction is to fit narrow strips along the side of the hull, usually projecting from the chine at an angle, which will deflect the rising sheets of water.

A model of a hull which was known to have good performance was selected, and to it were applied successively spray strips having various angles and various widths. Tests of these showed that the wider strips at sharper downward angles gave the better suppression of the spray and that the resistance was affected but little. A technical note describing these tests is being prepared.

Floats for seaplanes.—At the request of the Bureau of Aeronautics, the committee is investigating the manner in which variations in the form and dimensions of the twin floats used in high-speed seaplanes affect the performance during take-off. This investigation is conducted with model floats which are varied in dimensions and form much as in the case of the flying-boat hulls.

Fundamental information regarding planing surfaces.—For a large part of the take-off run of a seaplane that part of the weight of the craft not supported by the wings is supported by the hydrodynamic reaction of the water on the bottom of the float or boat. In the actual craft, or complete model, the various phenomena connected with this stage are so entangled that the effects from the bottom alone cannot be studied separately. However, by testing surfaces that skim along the top of the water simulating only the bottom of a float, much valuable fundamental information can be obtained, and by its use it will be possible to understand more perfectly what happens under the bottoms of actual floats.

Surfaces for such tests have been procured and tests are planned to begin shortly.

Frictional resistance of boat surfaces.—The frictional resistance of those surfaces of a boat hull which are exposed to the passing water has been determined quite accurately for speeds up to about 15 miles per hour. For speeds of from 30 to 60 miles per hour, or higher, the frictional resistance can only be estimated. Furthermore, the effect on this resistance of slight structural roughnesses produced by rivet heads, plate butts, etc., is practically unknown.

Friction plates which are to be towed at relatively high speeds to determine the frictional resistance and the effect of roughnesses have been procured and are being prepared for testing. The information obtained from these tests should make possible a decision as to how smooth a boat bottom need be or how large an increase in resistance must be accepted if rivet heads project. It should also help in the more accurate estimation of the resistance of model and full-size hulls.

From the Clubs

BRISTOL AND WESSEX AEROPLANE CLUB

February, March and April, so far as April has gone, have proved record months for the Bristol and Wessex Aeroplane Club. Since the middle of February there has been scarcely a day on which Club flying has not been possible, and members have taken full advantage of the exceptional spell of fine weather. Messrs. M. P. Morris and W. Hill completed the tests for the "A" licence and Mr. D. K. Roy expects to complete the tests in a few days, after which he will proceed with training for a "B" licence.

Arrangements for the Bristol Airport Flying Meeting on June 17 are progressing steadily, and special enclosures are being erected to accommodate 30,000 spectators. The race for the Society of British Aircraft Constructors' Challenge Trophy, which will be flown at the Bristol Meeting, will this year will be open to privately-owned aircraft as well as club aircraft, so long as the entry is made through a recognised club. In addition to the Challenge Trophy, there will be a cash prize of £75 and a special prize for the machine making the fastest time over the course. The course for the race is Shoreham to Bristol, with a turning point at Eastleigh. Entry forms can be obtained from the Manager, Bristol Airport, and the closing date for entries is May 31.

BROOKLANDS

Brooklands has been exceptionally busy again this last week. The high winds have naturally hampered the work done by pupils—especially solo—but in spite of this both School and private owners have put in good times. New members, Messrs. Davy and C. H. Hayter; first solos, Miss Tailyour, Miss Monro. Mr. K. F. Waller has had some advanced dual. Visiting types have been varied, including the "Gull," "Vega" and one of Sir Alan Cobham's Airspeed "Ferries." One afternoon saw all the de Havilland types at the aerodrome—"Gipsy Moth," "Puss Moth," "Fox Moth," "Tiger Moth" and "Dragon." Brooklands Airways have been busy on a variety of jobs; Capt. Ledlie is at the moment of writing on a flying tour of England in the Junkers—affording a very pleasant holiday indeed to the lucky party he is conducting. The Dawn Patrol has now become very popular, as mentioned previously, but last week's broke all records. In all, 35 machines from several aerodromes took part. Lympne and Sywell were due to attack Brooklands, and formated from their aerodromes with 15 machines. In addition, contingents arrived from Reading—including the Miles "Hawk"—and Hanworth, and were very welcome. As has been explained, the visitors get a free breakfast if not spotted, but this time Mr. Lowdell caught sight of the "enemy" leading his formation to victory before the invaders had crossed the appointed line. Arrangements for the next—in which it is hoped many more aerodromes will take part—are already well in hand. A new edition of the "Brooklands Book"—describing all flying facilities at Brooklands Aerodrome—is now ready; it includes chapters on "Flying Instruction," "Queries Answered," "The 'B' Licence," "Parachutes and Parachute Instruction," etc., as well as details of the new Brooklands Flying Club and its reduced rates. A copy will gladly be sent free and post free to anyone interested.

HANWORTH (N.F.S.)

The week's flying totalled 91 hr., and cross-country flights included Mr. Edinsell's to Burgess Hill, Mr. Bramson's from Shanklin, Capt. Findlay's and Mr. J. Borley's to Le Bourget and return, and Mr. Chen's triangular cross-country with Capt. Wilson for a "B" licence. Eight machines flew to Haldon aerodrome, Teignmouth, on Sunday, April 16, returning on Monday afternoon. Capt. B. Soman has returned from his ship. On April 16 Air Vice-Marshal Dowding flew at Hanworth, and Mr. Gordon England flew the B.A.C. "Drone." On April 17 many members flew backwards and forwards to watch the motor racing at Brooklands. The Hon. Ewan Montague took a trial flying lesson with Capt. Findlay, and Commander Boswell, R.N., who has been abroad, commenced flying again. Messrs. Wiltshire and Solder, of the Insurance Flying Club, have recently taken "A" licences. On Saturday morning the B.A.C. "Droue" was flown by Capt. Geoffrey de Havilland, who expressed his delight with the machine. The workshops are full up with work. The *Ballanca* is back after a successful tour abroad. Mr. James' Stinson is in for C. of A. renewal, and the Bristol "Fighter" for Empire Air Services has been passed out with a new C. of A. The workshops have produced a new type of patent metal aerodrome mark flag, which is spring loaded and can be landed on or taxied over without harm to machine or flag. Particulars may be had on application to Chief Engineer. The mudguards recently developed are now ready for fitting to most types of machines. On Wednesday, April 19, Lt. R. R. Bentley left Hanworth in his Comper "Swift" for a business tour in Scotland. Mr. G. E. Archdale flew to Norfolk for the Easter week-end, and Mr. Micklemore, of Whitney, and his party in a Bristol "Fighter" and an Avian called in on Thursday, April 20, and, on account of rather thick weather, stayed the night. A B.A.C. "Drone" has now been delivered to the British Hospitals Air Pageant, and one of these machines, piloted by Mr. Lowe-Wylde, took part in Sir Alan Cobham's demonstrations at Dagenham, Gravesend and Maidstone. Next Saturday, April 29, a dance will be held to mark the end of the winter season and the beginning of the summer.

SURREY AERO CLUB

Despite the cold weather of the last week, a number of Club members have carried out dual and solo flying. Sir Alan Cobham's Display, given at Gatwick on April 19, went off exceptionally well, but was somewhat marred by heavy snowstorms which must have kept away several hundreds of people. The Clay Pigeon Shoot for owners, trainers, and jockeys will be held after the first day's racing at Gatwick on May 12, and team entries are already being received. A Buffet Supper Dance for Club members and friends will be held on May 20, and applications for tickets should be sent in as soon as possible. Several members of the Sabena and Air Union lines visited Gatwick for tea last Sunday. Several new members have joined the Club lately. The tennis courts have just been re-dressed, and are now ready for playing on. Archery will also be installed shortly. Mr. Ames has joined the Redwing School of Flying and Aeronautical Engineering.

READING AERO CLUB

The fine weather during the Easter holidays has been responsible for much activity. During the week Mr. C. O. Powis demonstrated a D.H. "Tiger Moth" at Leicester, and on Good Friday the Miles "Hawk," which has received Air Ministry permission to visit other aerodromes, was flown by Messrs. Miles and Powis at Heston, Hanworth and Brooklands; on Saturday it was flown to Portsmouth. The Club are pleased to welcome the Baron G. S. A. W. Akerhielm of the Swedish Consulate, and Mr. A. B. Neilson of Norway, who have started instruction with the Phillips & Powis School of Flying. Mr. Ibrahim is putting in hours and progressing well towards his "B" licence. Two members of the Bristol Club called at the Club while returning from the Brooklands Races, and two machines of the Brooklands Club paid a visit. The "At Home" invitations for May 27 are being despatched during the week; it is hoped that anyone whose name has inadvertently been omitted will accept apologies and come along just the same. (Owing to an error it was stated in Reading Notes for April 13 that Mrs. Patterson took her "B" licence "last week"—this should have read "last year").

Seven machines of the Phillips & Powis School of Flying and Reading Aero Club took part in the "Raid" on Brooklands in the early hours of Sunday morning last. One flight, led by F/O. J. F. Lawn, with Mrs. Battye, who had with him Mr. and Mrs. C. O. Powis in the Miles "Hawk," and Mr. and Mrs. Pleydell-Bouverie in a "Moth" approached Brooklands from the south west at 3,000 ft., but were intercepted by a "Defending Formation" over Guildford. Mr. Lawn managed to make a getaway without his registration being read, but the others were duly noted and had to pay the penalty when they landed. The second flight, led by Mr. C. A. N. Bishop, and consisting of Messrs. Swann, Ibrahim and Fielding-

Richards, went by way of Heston and Putney, and approaching their objective from the north-east at about 200 ft. were successful in getting through unobserved. They were afterwards heard bragging with great glee that they passed right under an "Enemy" patrol near Heston without being seen. Mist has its uses! A return conflict, the "Defence of Reading," has been arranged for Sunday, May 7, on which day also the British Hospitals Display is being given at Woodley. The repair shops are busy with various C. of A's. and a number of jigs are being laid down for the production of the first three "Hawks" that have been ordered.

FILM FLYING CLUB

The Film Flying Club are holding their first annual dinner to-day (April 27) at the Kit Cat Restaurant. This Club is newly formed, and is using Broxbourne Aerodrome, the home of the Herts and Essex Club. It is hoped at this dinner to make a full announcement regarding the Club's activities, but anyone who is interested and requires further details should communicate with the Hon. Secretary, Aubrey J. Flanagan, The Regal Cinema, Marble Arch.

LYMPNE

Unfavourable weather conditions have somewhat reduced the amount of flying by the Cinque Ports Club last week, but even so 40 hr. flying have been done, which is quite satisfactory considering the high winds. Early morning flying has been popular, and Lympne enacted one of the "attacking" formations on the big patrol on Sunday, the 23rd. Mr. W. E. Davis has paid a visit to the de Havilland Aircraft Co. to make inquiries about the new "Leopard Moth." We are disappointed that this will not be ready until September, so that the Club's hopes of having two in the near future have been somewhat dashed. However, Mr. Davis has placed a provisional order for the two, and provided that it fulfils its present promise, this type seems likely to be an exceptionally popular and successful one.

NORTHAMPTONSHIRE AERO CLUB, SYWELL

The Club has been busy during the past week owing chiefly to the extra hour of summer time; the bad weather which has attacked Lympne and Brooklands seems to have passed Sywell by. The formation for Brooklands on the "Dawn Patrol"—which sets out with high hopes of getting through without being seen!—was Mr. and Mrs. H. Deterding, Mr. J. and Mr. G. Linnell, Mr. P. and Miss D. Tyzack, Mr. E. Danson, Mr. E. Pacey and Mr. S. A. Thorn. The same formation is visiting the Norwich Club on the following Saturday evening and will return on the Sunday morning. Mr. R. Casteel is approaching his solo, Mr. R. A. Bosworth has returned to take instruction after hibernation, and many others have been "solo-ing" regularly. Weekly lectures are given in the clubhouse on Wednesdays at 8.30 p.m. The last was on "Meteorology," and was well attended; it is hoped that there will be a large gathering of members to bombard the lecturer with questions in future weeks (it may seem strange, but he likes it!). Please note that the next Club dance will be on May 6.

MAIDSTONE AERO CLUB

Over 40 hr. have been flown during the past fortnight. The Club have now started their navigation classes and they are being well supported. Bookings for week-end flying are as full as ever, and members are taking advantage of the long evenings to get in as much flying as possible. On Tuesday, April 18, the visibility was remarkable, from 3,000 ft. the English coast being visible from Clacton to Worthing, and the French coast from Cap Blanc Nez to south of Boulogne. On Wednesday, April 19, Mr. F. M. Day passed his "A" licence tests. On Saturday, April 22, a Mounted Gymkhana was held, which was a great success. On Sunday, April 23, an informal Arrival Competition was held; several machines took part from Southend, Hatfield, Gatwick and other places. On Sunday, April 30, a Scavenger Hunt will be held from 3 p.m.

SKEGNESS AND EAST LINCOLNSHIRE AERO CLUB

During Easter both the "Fox Moth" and the "Puss Moth" have been kept very busy joyriding, and there has been a considerable amount of solo and instructional flying. Mr. W. Butlin, whose headquarters are at Skegness, has taken up flying again, and was flown down to Littlehampton one morning to his new amusement park there. Mr. Mitchell, of Nottingham, has joined with the intention of passing his "A" licence before leaving for South Africa. Flying time for Easter week was approximately 70 hr.

SUSSEX AERO CLUB

During the past ten days there has been considerable activity at the newly-formed Sussex Aero Club's aerodrome at Wilmington. Among visitors were Mr. Deterding and friend in their "Moths," and Mr. and Mrs. Presland. A "Puss Moth," Comper "Swift" and "Sports Avian" also visited the Club. Over 20 hr. flying has been done by Club members; Messrs. Bayley and Jonas are progressing favourably towards their "A" licences, the latter having completed his first solo. Mr. Wardle is returning to flying and put in an hour over the week-end. There seems every hope that this club will become very popular, being close to Eastbourne and on the main Eastbourne-Lewes road.

ROYAL AIR FORCE RESERVE FLYING CLUB

It has been decided to form a flying club for Reserve Officers with the object of providing an unlimited amount of flying at a minimum cost. The headquarters of the Club will be at Hatfield Aerodrome, and de Havillands have generously offered to supply a machine at a reduced figure and charge special low prices for housing and maintenance. The qualification for membership is any pilot on the Reserve (Classes A, AA or B with a minimum flying qualification of 50 hr.). The Air Ministry have been consulted and have not only approved but are giving the Club certain facilities as regards the loan of Service parachutes. The annual subscription will be £4, payable in two instalments. The price of solo flying will be as low as £1 an hour, and there will be no entrance fee for the first 60 members, who will be founder members. The President of the Club is F/O. R. E. G. Brittain, a son of Sir Harry Brittain, K.B.E., C.M.G., LL.D., a Director of Messrs. Napiers. The formation of this Club is an excellent idea and should prove exceptionally popular. If given the backing it deserves it might easily become, in a very few years, one of the most popular and efficient clubs in the country. There must be many Reserve Officers who will welcome this opportunity of not only obtaining cheap flying but of renewing old acquaintances. One might almost suggest to the promoters that it would be an excellent idea to run a Reserve Officers' Club in the West End in conjunction with this Flying Club, which, incidentally, would be the fulfilment of a project which has been put forward before. Anybody wishing to join or to receive further information should apply to the President, 2, Cowley Street, London, S.W.1.

THE "SCUD II" AT EASTER

Messrs. J. P. Dewsbury and G. U. Buxton took their British-built sailplane, the "Scud II," to Yorkshire during the Easter week-end. They were gliding near Ingleby, Greenhow, and made some very creditable flights. On Saturday the wind was about 25 m.p.h. on the ground from the west, which is not ideal, as the bowl formation of the site really faces N.W. The eastern spur of it, however, runs well out into the plain in a northerly direction, so that a west wind can be used for soaring. Buxton made the first flight and immediately climbed at great speed for about 1,000 ft. After another 600 ft. he began to meet clouds above the hill, through which he at first had to fly. After a time he found that by flying forward away from the face of the hill he could still maintain height and eventually reached an altitude of 2,360 ft., which is an unofficial British record. Unfortunately, an official record cannot be claimed, as owing to a misunderstanding no barograph was carried. After 45 min. Buxton landed and Dewsbury took over. By this time, however, the clouds had ceased to form and Dewsbury explored the bowl itself. He found the up-current good and the air not very turbulent; moreover, there did not appear to be any down-current caused by the western arm. He reached an altitude of some 1,740 ft. and landed after 55 min. In the afternoon Buxton took his turn at exploring the bowl, eventually gaining an altitude of some 70 ft. more than Dewsbury did. He also went away along the hills to the north, but could not find any suitable up-currents, and landed after 1 hr. 55 min. in the air. When Dewsbury went up later the wind had dropped considerably, but despite this he was able to maintain height successfully out over the hill. During this flight Mr. Slingsby arrived from Scarborough with his "Falke," and later in the evening the two machines flew together. The best speed of the "Falke" appeared to be about 3-5 m.p.h. slower than the "Scud." The total flying time put in on the "Scud" during the week-end was 6 hr., which shows how quickly real soaring puts up the flying time.

Air Transport

A SUCCESSFUL SEASIDE AIR SERVICE

A SEASIDE AIR SERVICE : Passengers alighting from the E.A.S. " Fox Moth " used on the Skegness-Nottingham service.

AN experimental air service between Skegness and Nottingham was operated with marked success by Eastern Air Services, for one week from Good Friday, April 14. The operators had originally proposed to make one flight daily in each direction on the route Skegness-Nottingham-Birmingham, but as the Castle Bromwich aerodrome was not available, the last stage could not be operated.

More than 20 round trips were, however, made between Skegness and Nottingham in the week, mostly with a full aeroplane. The fares charged were 20s. single, 25s. return.

A " Fox Moth " carrying four passengers was used, with a " Puss Moth " when only two were forthcoming. The former machine averaged about 40 min. for the 60-mile journey, the latter about half an hour.

Mr. M. D. L. Scott, founder of Eastern Air Services (who operate the Skegness and Eastern Counties Aero Club) was the chief pilot, assisted by Mr. Hill. Our correspondent was informed by Mr. Hill that E.A.S. propose to resume the service at Whitsuntide, and thereafter to operate daily throughout the summer season. It is hoped to secure the use of an aerodrome near Birmingham.

The last machine on the experimental service was the " Puss Moth," which, piloted by Mr. Scott, set out from Skegness aerodrome for Nottingham promptly at 6.30 p.m. on April 21.

INDIAN AIR LINES

NOW that the Karachi-Madras Air Mail has been functioning for some months, it may be of interest to know some of the results of its working, the prospects of further development and certain difficulties under which the service is at present being operated.

The curve in the graph recording the quantity of mail carried by this service rose to a high peak at Christmas. Then for a short time after, the effect of the recess was reflected by a sharp drop in the curve, but recently this has again been rising, and it may soon ascend to a point above the Christmas peak—an index of progress which is quite satisfactory for a service which is vitally hampered in several respects.

So far as the organisation itself is concerned, there has been no hitch in the service, which, since the start, has been run with perfect regularity in both directions. The machines are working efficiently. In four months they have performed a total of 32 regular journeys between Madras and Karachi via Bombay, and have flown an aggregate distance of 42,560 miles. But conditions will, of course, be different in the monsoon season when, on many occasions, the Ghats (mountain range) will be overhung by cloud and mist.

For operating under such conditions, it would be essential for the machines to be equipped with wireless directional gear, but owing to the prevalence of violent electrical disturbances during this period, the most suitable type of wireless installation will have to be decided upon. Our correspondent understands that the Tata Company are negotiating with the Government for the loan of the necessary equipment in order to carry out the necessary tests.

Without such radio equipment, however, it is agreed that flying across the Ghats in the monsoon season would be out of the question. It has, therefore, been decided to make a deviation from the existing route during the monsoon and to fly for a certain distance to the eastward of the Ghats. Accordingly, instead of landing the mails for Bombay at Juhu as at present, the planes will fly direct to Poona and there land the mails, which will be transported to Bombay by car.

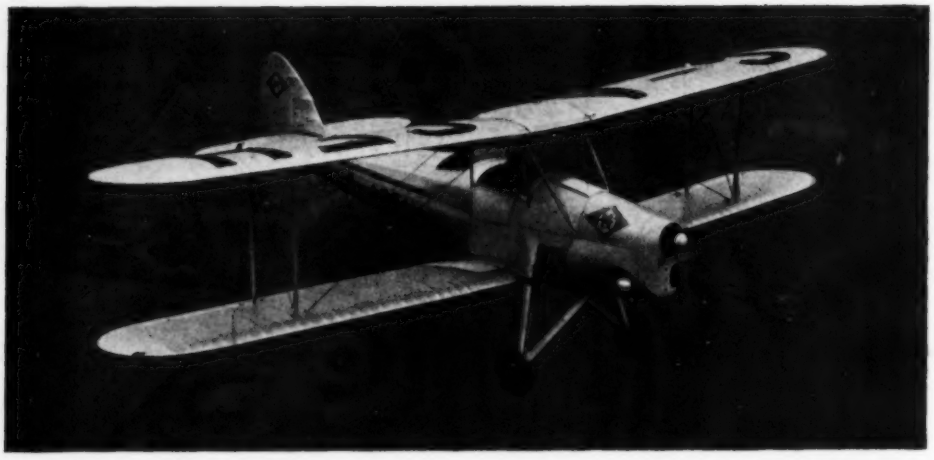
An important change in the present route of Tata's air mail service between Bombay and Madras is also impending, as a result of the negotiations now in progress between Tata's and the Nizam's Government. The Nizam's Government of Hyderabad have appointed a Civil Aviation Board constituted of representatives from the Army, Finance, Postal, Commerce and Railway Departments with Nawab Wali-ud-Dowlah Bahadur as President, to consider the question of developing civil aviation and a State aviation service in Hyderabad.

A sum of Rs. 20,000 annually will be paid to Tata's for diverting their present Bombay-Madras route from Bellary to Hyderabad. The change in the route is justified by the very great importance of Hyderabad, far the largest State in India, and an increase in revenue will certainly result from the change.

It is understood that the Hyderabad Civil Aviation Board proposes to organise a civil flying club and maintain four aeroplanes for a mail and passenger service between the capital and important district headquarter towns in the State.

Finally, an air mail service between Karachi and Colombo (Ceylon) is likely to come into operation this year, according to contracts which it is understood have just been settled with Tata interests, and this new " leg " of airways is expected to come into operation some time in the autumn.

It is reported that the Bengal Flying Club is considering a scheme to link up the chief towns in the Province of Bengal by a regular passenger air service, radiating from Calcutta. At present the Club only possesses single-passenger machines, but if the scheme proves a success, they would be prepared to purchase four-seater machines.



A THREE-SEATER "CADET": The above new version of the Avro "Cadet" ("Hermes IV") has been delivered to Scottish Motor Traction for their joyriding activities. This three-seater is the first of a new series of "Cadets" which will shortly appear on the market. (FLIGHT *Photo.*)

African Air Mail Speed-up

WITH the departure from Croydon on April 26 the Imperial Airways African air mail service will now occupy 10 days instead of 11 days—a further reduction to 9 days being, it is hoped, effected later in the year. Henceforth the stage between Cairo and Khartoum on the southward journey will be flown in one day instead of two, cutting out the night stop at Wadi Halfa. The air mail will thus be accelerated by one day to Khartoum, and all places to the south, and will arrive at Capetown on Saturdays instead of Sundays. The accelerated northbound air mail, after leaving Khartoum, will cease to make a night stop at Wadi Halfa and will fly through in one day to Assuan. The flight will continue the following day from Assuan right through to Alexandria, instead of Cairo, cutting out the train section between Cairo and Alexandria. This will be made possible by transferring passengers and mails at Cairo from aeroplane to flying boat, which will leave the Nile and fly to Alexandria. The crossing of the Mediterranean will also be accelerated, the 960 miles between Alexandria and Brindisi being flown in one day (cutting out the night stop at Athens) instead of two. The net result of these savings will be that the air mail will reach London on Saturdays instead of Sundays.

Another Rail-Air Service?

FOLLOWING the recent inauguration by the Great Western Railway of an air service between Cardiff and Plymouth comes a report that the London Midland & Scottish Railway Co. are considering a scheme for air services between the Manchester airport and the Isle of Man and Ireland.

Bristol—Cardiff Air Ferry

THE Bristol-Cardiff Air Ferry has been running to capacity during the Easter holidays. The number of passengers has necessitated putting on an additional service, and on two occasions the normal service had to be augmented with an extra machine. Within a few weeks it is hoped to run the Bristol-Cardiff Ferry to connect regularly with the Cardiff-South Devon Service, which is run by the Great Western Railway Company.

Air Travel Vouchers

LARGELY for the convenience of business men who are making a regular use of air transport to and from the Continent, an experiment is being tried by Imperial Airways in the issue of "Season Travel Vouchers," which take a form similar to a banker's letter of credit. Any passenger flying frequently by Imperial Airways' Continental routes can now obtain a "season travel voucher" worth, say, £100, and available for four months. Tickets as required will then be issued against this voucher at any of the company's airway offices, the necessary entries being made on the voucher. Such a voucher confers on the purchaser the advantage of a substantial discount off the ordinary fares, while the system of drawing single tickets for each journey relieves the holder of the restrictions imposed by the varying periods of validity of the ordinary return tickets. The vouchers are sold in multiples of £100 face value, with periods of currency of four months on £100, eight months on £200 and twelve months on £300 or over.

London—Singapore by Air

ON May 4 the Royal Dutch Air Lines (K.L.M.) will inaugurate a weekly air service between London and Singapore—approximately 6,060 miles. Passengers will leave Croydon by the mid-day machine for Amsterdam, connecting there with the Amsterdam-Batavia service, which will call at Singapore. The outward journey will take eight days, and the homeward journey seven days.

Singapore-Darwin Air Route

MR. H. W. ROSS, who has been appointed to survey the proposed Singapore-Darwin route, by the Australian Government, has arrived in Batavia from Singapore.

German—Italian Air Routes

FOLLOWING the visit of Capt. Goering, the German Air Minister, to Rome, the air services between Italy and Germany are to be extended. The summer service, Rome-Venice-Munich-Berlin, is to be run throughout the winter, and a fast 6-hr. non-stop Rome-Berlin service is to be organised. The Milan-Trento-Bolzano line is to be speeded up and flown in connection with the Innsbruck-Munich line. This is expected to become popular as a tourist line, covering as it does some of the most imposing stretches of Alpine scenery.

French Air Lines to Combine?

IT is reported that the French Air Minister, M. Pierre Cot, is considering a scheme for the fusion of the five principal subsidised French air lines—Air Union, Air Orient, Aéro Postale, Cidna, and the Farman lines.

East African Aerodromes and Meteorological Stations

REPLYING to a question in the House of Commons on March 30, Sir P. Cunliffe-Lister said that as regards aerodromes, arrangements were made last year, after inspection by an Air Ministry expert, for improving aerodromes in Tanganyika and Northern Rhodesia to meet the requirements of the Cairo-Cape Town air mail service. The improvements in Tanganyika are being made by the aid of a grant from the Colonial Development Fund, in Northern Rhodesia through the generosity of the Beit Railway Trustees. The aerodrome at Nairobi is also being improved for the same purpose with the assistance of the Colonial Development Fund. The expert mentioned above has also inspected the aerodromes in Uganda, and the Protectorate Government is awaiting his advice. In view of the action being taken, no special representations have been made to the East African Governments. As regards the meteorological service, no special developments are contemplated in 1933.

Airisms from the Four Winds

Missing Long-distance Airmen

THERE has been no further news of the two long-distance flyers, Dr. Robbiano and Capt. Lancaster. The former, it will be remembered, left Lympne on April 8 in an attempt to beat the England-Australia record, and has not been heard of since he left Calcutta for Victoria Point on April 14. Wreckage of what was thought to be his Breda 33 were found near Sandwip Island, off Chittagong, but it appears that the report that his body had been found nearby is incorrect. Capt. Lancaster, who left Lympne on April 11 for the Cape, was last seen when he left Adrar for Gao on April 12. Although extensive search has been made over the desert, no trace of man or machine has been found.

Mrs. Bonney Crashes

MRS. BONNEY, who is flying from Australia to England, has come to grief. She left Singapore on April 20 and after reaching Alor Star set out again for Victoria Point. Her non-arrival there caused some anxiety, and it was not until April 23 that news was received that a R.A.F. flying boat had located her on the Siamese Island of Bang Baing, where she had crashed. Her machine was damaged, but she was unhurt. A relief boat was sent with food and supplies, and later she was taken, with her machine, on the s.s. *Juna* to Rangoon.

Japanese Air Dash

MR. KAYSUTARO ANNO, a young Japanese airman, is planning to fly from Berlin to Tokio, by way of India and China, a distance of some 12,000 miles. He is flying an aeroplane powered by a 150 h.p. engine, and capable of a speed of 145 m.p.h.

Mlle. Hilz Returning

THE French airwoman, Mlle. Maryse Hilz, who flew from Paris to Tokio in 16 days, left Tokio on, or about, April 23 on her return flight to Paris.

Aeroplane Lands in the Shetlands

ON April 19 a machine specially chartered from the Scottish Motor Traction Co., by two Edinburgh business men, landed in the Shetland Isles, and is the first machine to do so. In spite of a strong northerly gale and heavy snow showers, the journey was accomplished in 5¼ hr., with stops at Inverness and Kirkwall, which is 50 hr. less than the railway and steamship journey.

U.S. Airship for Smithsonian Institution

THE Smithsonian Institution at Washington, U.S.A., has just installed among its thousands of exhibits the Goodyear airship *Pilgrim*, a craft whose technical and historical interest makes it worthy of association with many other notable aircraft displayed there. The *Pilgrim* has the distinction of being the first airship designed for inflation with helium gas, and was completed early in 1925. It is 109 ft. 6 in. long and 31 ft. 6 in. in diameter, and has a seating capacity for a pilot and two passengers. Up to December 30, 1931, when it was retired from service, the *Pilgrim* had made 4,765 flights, carried 5,355 passengers, flown 2,880 hours, and covered 94,974 miles. It is fitted with a 60-h.p. 3-cyl. Lawrence engine, which gave a speed of 40 m.p.h. and a range of 525 miles.

"Macon's" Maiden Flight

THE United States airship *Macon*, sister ship to the *Akron*, left Akron, Ohio, on Friday, April 21, for her maiden flight. There were 105 people on board, and the airship took the air early in the morning with no difficulty, commanded by Commander Alger Dressel. It is reported from New York that a sunken object, located near the scene of the *Akron* disaster, is believed to be the main body of the ill-fated dirigible.

Air Crossing of the Antarctic

SIR HUBERT WILKINS, the Polar explorer, reached Southampton in the *Bremen* on April 21. He is on his way to join the Ellsworth Antarctic Expedition, which will leave Norway on August 1. The present plan is to fly over the Antarctic Continent from the Ross Sea to the Weddell Sea, a project never yet attempted by air. The outward and return flight, which will be attempted non-stop, will extend over about 3,000 miles. A Northrop monoplane, similar to that supplied to Frank Hawkes and previously described in FLIGHT, will be employed. Sir Hubert Wilkins has stated that when he returns from this trip he will attempt a submarine expedition to the Pole.

Junkers L.5 Engine Re-rated

THE Junkers L.5 engine has recently passed the German D.V.L. type tests at a higher rating. Two compression ratios are available, 5.5:1 and 7:1. The former now develops 380 b.h.p. instead of 310 b.h.p., and the latter 425 instead of 360. The powers for prolonged running are 340 b.h.p. and 360 b.h.p. respectively at 1,600 r.p.m. The new engines will be known as the L.5 G to distinguish them from the older L.5.

Crash in Sea

AN aeroplane crashed into the sea off Skegness on the evening of April 23, the passenger, Mr. James Barton, of Grimsby, being drowned, the pilot, Mr. Walter Shaw, also of Grimsby, being rescued. Shaw and two others who swam out to the machine made repeated attempts to rescue Barton, but could not get him clear of the wreckage.

Fokkers for Denmark

FOR many years past the Danish Military Air Force has been equipped with Fokker aeroplanes, built in Denmark under licence. This equipment has always given the greatest satisfaction, as witness, for instance, the success of the Danish squadron at the International Aviation Meeting at Zürich last year, when they obtained the first prize for formation flying. In view of the fact that more and more is being required of both machines and engines for military work nowadays, the Danish Government was induced to acquire new flying equipment, and the Government's choice fell on the latest version of the Fokker C.V., which is to be powered with the Bristol "Pegasus" engine. A licence to build this type in Denmark was accordingly acquired from the Nederlandsche Vliegtuigenfabriek, and at the same time an order was given to supply a machine to serve as a model.

Manfred Von Richthofen

THE fifteenth anniversary of the death of Baron Manfred von Richthofen was commemorated on April 21, by a service at the airman's grave in the Invaliden Cemetery, Berlin. Baron von Richthofen was brought down on the Somme on April 21, 1918.

Strange Death in Aeroplane

MR. JAMES DAVISON, aged 40, died recently while making a flight from Geneva to Paris. Before reaching Lyons he felt ill, but decided to carry on to Paris to see his doctor. Shortly after leaving Lyons, however, he died.

Aerial Photographs Exhibition

THE many uses to which aerial photography can be put are clearly demonstrated by a collection of photographs which are on view at the Walker Galleries, 118, Bond Street, from April 20 to May 3. There is a beautiful view of the ornamental gardens of Bickling Hall, also photographs of Sandringham, Fort Belvedere, Viscount Astor's country seat at Clivedon, the Duke of Devonshire's house at Chatsworth, Beaulieu Abbey and Windsor Castle, the latter spoilt by shadows and angle. Photographs of estates or houses taken from the air give a much more comprehensive view than those taken from the ground, and therefore are invaluable to estate agents. A photograph of Tooting district gives an excellent impression of the drab monotony of compact buildings, while a more modern housing estate at Kendal is shown to be not much better. Promoters of garden cities and municipal authorities planning solutions to the slum question would do well to take an aerial view of the attempts of others, and so perhaps avoid the many mistakes which have already been made. A remarkable photograph of the golf course at the R.A.C. County Club at Woodcote gives a clear idea of the value of aerial photography to those laying out such courses. A vertical view of the centre of London shows the assistance that could be given to map makers by the aerial camera, and for sheer beauty there is a magnificent photograph of Salisbury Cathedral, and an excellent view of Oxford which brings out, as no ground photograph could, the delicate but perfect proportions of that ancient and noble home of venerable learning, Christ Church. The majority of the exhibits were taken by Aerofilms, Ltd., of Bush House.

Airport News

CROYDON

DURING the week there were no less than five cases of mothers carrying babies in arms travelling in Air Union aeroplanes to and from Paris. On Thursday, two mothers and their babies travelled in the same aeroplane. The problem of travelling to mothers, who have children so young that they have to be carried, presents many difficulties, and in such cases women have often expert opinion of travel—this is no doubt why they are using the airliners in increasing numbers.

On Friday, April 21, Air Union carried a record number of passengers on their Marseilles service. In all, 39 passengers flew from Marseilles to Paris in six Breguets—the journey from Paris to Croydon being completed by three LeO. machines. The Breguet machines left Marseilles between 11.30 a.m. and 1 p.m., and, although a strong head wind of 75 m.p.h. was encountered in the Rhone valley, all of the passengers had reached Croydon by 9 p.m.

One notable passenger to arrive at Croydon on Friday was Lady Evelyn Cobbold, who is believed to be the first English woman to make the pilgrimage to Mecca.

Mrs. Corbett-Ashby flew by K.L.M. to Amsterdam and returned the following day by air.

The Hon. Mrs. Victor Bruce arrived by Air Union from Paris on Saturday afternoon and transferred to her Fairey "Fox," in which she flew to Hanworth. Mrs. Victor Bruce is flying for the British Hospitals Air Pageants Tour, but took a few days' leave in order to compete in a motor rally in the South of France.

Capt. Birkett, of Birkett Air Services, also arrived in his "Puss Moth" from Warsaw with Press photographs and proceeded to Heston.

Surrey Flying Services had a special charter to Ostend by Mr. Zollman, who had to catch an express train at Ostend. Upon finding that he had missed the boat train at Victoria he telephoned to charter their "Fox Moth." The machine and the pilot, Mr. T. Hancock, were waiting on the tarmac for him when he arrived at Croydon, and within a few moments they were speeding towards Ostend, where they landed 75 min. later. As the aeroplane passed over the harbour Mr. Zollman pointed to the cross-Channel boat on which he should have sailed—it was just entering the port. A motor car which had been ordered by wireless was waiting to rush him to the station, where he caught his train in good time.

Among the passengers to arrive on the Imperial Airways' African airliner *Heracles* at 11 a.m. on Sunday was 11-year-old David Rydon, who had travelled unaccompanied approximately 5,000 miles from Kenya. He is a son of the Hon. H. E. Rydon, and had been sent by his parents to England to join his elder brother at Cheam School, Surrey. David said that he enjoyed every inch of the journey, but the part he liked most was passing over Uganda, where he saw hundreds of elephants. In addition to his personal effects he brought with him a treasured possession—an air gun. He expects to remain in England for about 10 years and will go to a public school when he leaves Cheam.

A party of well-known people who travelled to Paris on the Imperial Airways' airliner *Hengist* at 12.30 p.m. on Sunday were Mr. Raymond Massey, the famous actor, and his wife; Sir N. Pearson, accompanied by Lady Pearson (Gladys Cooper), and her son, John Buckmaster.

Miss Brigitte Helm, the German film star, who has been spending a few days' holiday in London, returned during the week by D.L.H. to Berlin.

The German airliner which was damaged on March 17 has now been repaired and was placed on service again this week.

Steady progress is being made in the production of "Monospars." Recent deliveries include one to Highland Airways for regular service between Inverness and Orkney and one to Mr. Robert Germain, who arrived in Algiers in good time for the rally, on Easter Monday. Other deliveries which are expected to be made almost immediately are one to Swiss Air Lines and another to the Asiatic Petroleum Co. The Swiss Air Lines already have a "Monospar," which has been used partly on a feeder service and partly for special charters. So successful has the "Monospar" proved itself to be that both the machines will be placed on regular airline work. Three orders have also been booked for the new model fitted with retractable undercarriages.

Owing to thick fog in the Channel, continuous drizzle and visibility of only 100-200 metres over the hills in the South-East of England, Capt. Horsey, the pilot of the Imperial Airways airliner *Hengist*, which left Paris at 3.30 p.m. Monday, the 24th, was compelled to abandon his flight to Croydon and return to Paris, having been in the air for 2 hr. 17 min.

The pilot of a French airliner which arrived safely at Croydon, having followed a course transmitted from the directional wireless beam mast, said that he had experienced a most unpleasant journey—he circled the aerodrome several times before attempting to land.

Imperial Airways' 6.45 p.m. service from Croydon to Paris was cancelled, but the incoming machine, piloted by Capt. Rogers, left Paris at 7 p.m. with 25 passengers and 160 kilos of gold, and completed the journey in 2 hr.

Imperial Airways have added to their already extensive fleet of aeroplanes a new Westland "Wessex" (G-ABEG).

The total number of passengers for the week was 1,807; freight, 53 tons 18 cwt.

"HORATIUS."

FROM HESTON

THE Customs clearances for the week reached the new high level of 66, the latest or earliest arrival being Mr. Morris Jackaman in his "Monospar," who landed at 1.10 a.m. with two passengers, having completed the journey from Berck in 1 hr. 5 min.

Blind flying is proving very popular on the School.

B.A.N. Co. have lived in the air this week, having flown a total distance of 6,086 miles, their charters taking them eight times to Berck, twice to Dublin, Stirling, Berlin and Warsaw, and once to Stolpce, Calais and Rotterdam. On their regular Le Touquet services they carried 42 passengers.

Spartan Air Lines on their regular Heston-Cowes week-end services are so punctual that it is possible to set watches by them.

On Friday, Brian Lewis & Co. took delivery of a De Havilland "Dragon" for demonstration purposes; it worked hard all day on Saturday. It starts next Sunday, flown by Flt. Lt. C. Clarkson, on a tour of all England.

On Saturday the tarmac staff were kept busy handling 56 private aircraft during the course of the day.

Sir Philip Sassoon

SIR PHILIP SASSOON, the Under-Secretary of State for Air, accompanied by Air Vice-Marshal A. M. Longmore, C.B., D.S.O., left Calshot on April 13 in a new "Rangoon" type flying-boat for Malta on a tour of inspection. They arrived on April 17. The freedom of the borough has been conferred on Sir Philip Sassoon by the Hythe Town Council. It is interesting to note that the last freedom conferred by Hythe was on Lord Wakefield in 1930.

Correspondence

The Editor does not hold himself responsible for opinions expressed by correspondents. The names and addresses of the writers, not necessarily for publication, must in all cases accompany letters intended for insertion in these columns.

INTERNATIONAL AIR TRANSPORT

[2848] Will you permit me to express through your journal my thanks to Mr. Florman for putting me right on a point of law ; to visit Sweden by air it is not necessary to give prior notification of your arrival. Nevertheless, the statement needs qualification to the point almost of making Mr. Florman's statement appear as incorrect as was my own.

There are only two civil aerodromes for land aeroplanes in Sweden ; one is at Göteborg, the other at Malmö. At either of these you may land and clear Customs without notifying anyone beforehand. If anyone returned to England after having flown to Malmö and Göteborg and said they had seen Sweden I should consider that they were exaggerating.

No one has seen Sweden until they have been to Stockholm and until they have flown over *and smelt* the magnificent pine forests that you have to cross to get there. To do that with a landplane you must land at Swedish military aerodromes. Before you land at Swedish military aerodromes you are required to send word of your intention to do so. I failed to do so on one occasion and I was roared up by our Air Ministry on my return.

It is a small price to pay for the exquisite pleasure you should get out of your visit. Indeed, members of the Automobile Association may have it done for them by special arrangement with the Svenska Motor Klubben. If one could persuade oneself that this little formality really served a useful purpose it would not be worth mentioning again. As it is, one comes away with the impression that one has to notify Sweden before one can fly there. This, as Mr. Florman says, is wrong ; how wrong, I have been able, by your courtesy, Mr. Editor, to confess. I thank you.

IVOR MCCLURE.

London, W.1.
April 10, 1933.

BARRIERS TO AIR TRAFFIC

[2849] In your number for April 13, under the notice of the de Havilland School of Flying, you refer to the desirability of pilots carrying with them to Turkey and Palestine their permits to fly over these countries.

Repeatedly the Turkish authorities have been asked to issue a written permit showing that the bearer has permission to fly over Turkey. They refuse on the grounds that the permit is unnecessary ; when permission for a flight over Turkey has been given every man, woman and child along the route to be flown has been told the name and address of the pilot and passengers and the manufacturer's number on each engine. In the face of such an assertion there is little to be done except to report the full circumstantial details of each case in which the gentlemen at Angora can be proved to be wrong.

Palestine should not be classed with Turkey. Aeronautically it comes under the Middle East Command of the Royal Air Force, and a more enlightened administration it should be difficult to find—thinks you! The Middle East Command has gone native, psychologically speaking!

Shocked at the possibility of a civil aeroplane entering Palestine, the officers of the M.E.C. struck some pretty Oriental attitudes and, without telling the civil side of the Air Ministry over here, demanded permits from the civil pilot. He had to confess that he was guilty of *sabotaging* the rules governing civil aviation in Palestine.

When he was ready to continue his flight he was told that he could not land at R.A.F. aerodromes without special permission. As there is only one civil aerodrome, that made it good and awkward for him. Having held the poor beast up another day or two, the M.E.C. thought up a new one. When once more he was ready to depart, they primly detained him because no civilian is allowed to fly in Palestine on a Sunday. Not Saturday, for the sake of the Jews, not Friday for the sake of the Arabs, but Sunday for the convenience of the M.E.C.

We poor civilian aviators are much in the same position as passengers who travelled by train on the Continent soon after the Armistice. The conditions in those overcrowded trains were abominable and at a Swiss station a black swarm of infuriated humanity descended on the deputy stationmaster. I heard him later pouring out his troubles to the stationmaster. This magnificent personage, this eminently stationary master, threw up his arms in a gesture of incomprehension. " Mais qu-est-ce qu'ils ont à voyager? Est-ce que je voyage, moi?"

IVOR MCCLURE.

London, W.1.
April 13, 1933.

AFRICAN BUSINESS TOUR

[2850] Please note that in your Airport News, Croydon, FLIGHT of March 30, 1933, you state about Mr. W. A. Burnside and Mr. Chamberlain going to South Africa, that they have an *" A " licence* certificate. Kindly note my son, Mr. W. A. Burnside has an *" A " and " B " licence* and is a fully qualified airman and Reserve Officer, R.A.F. So far I believe they are getting on very well with their flight and have arrived at Cairo. Of course, I am very anxious over it all, and hope to hear shortly of their safe arrival at Cape Town. I suppose the S.A. papers will report their arrival, as for two young fellows it is a plucky thing to do, and I hope and trust it will be well advertised, being the first commercial aeroplane to go out.

F. S. BURNSIDE (MRS.).

London, S.W.7.
April 8, 1933.

International Flight over Alps

THE first international flights over the Alps will be held from May 16 to 21, when pilots from Austria, England, Germany, Italy, Hungary, and Poland will take part. A 71-year-old Englishman, Mr. A. J. Richardson, will be one of Great Britain's representatives. He only learned to fly recently, but is very keen.

King's Cup

IT was decided at the meeting of the Racing Committee of the Royal Aero Club to extend the closing date of entries for the King's Cup Air Race to Friday, May 19, 1933. Late entries at double entry fee will be received up to May 31, 1933. The Committee selected the following four courses:—

1st Course.—Hatfield-Felixstowe-Bircham Newton-Hatfield. Approximate distance, 220 miles.

2nd Course. — Hatfield - Cranwell - Desford - Hatfield. Approximate distance, 206 miles.

3rd Course.—Hatfield-Bircham Newton-Wittering-Hatfield. Approximate distance, 193 miles.

4th Course (for the final).—In the final the competitors will fly two circuits of the following course:—Hatfield-Henlow-Upper Heyford-Hatfield. Approximate distance, 102 miles—two circuits approximate 204 miles.

International Air Races

THE Racing Committee of the Royal Aero Club have examined and approved the regulations for the International Air Races to be held at the Portsmouth and Southsea Airport on August 4, 5 and 6, 1933.

Agello not Satisfied

WARRANT-OFFICER AGELLO is to make an attempt to beat his own record. He will fly a seaplane powered by a more powerful engine, and fitted with floats of wood in place of duralumin. On April 18 Col. Bernasconi, head of the high-speed flying school, is reported to have achieved a speed of 437 m.p.h.

74 Miles' Glide

A FLIGHT of 74 miles has been accomplished by a glider from Griesheim, near Darmstadt, to Mimbach in the Sarre. The glider was piloted by the German airman, Riedel, who took three hours to accomplish the flight.

The Industry

SPRINGS

SALTERS, of Smethwick, Birmingham, are an old-established firm who have specialised in springs since their inception.

Springs are tricky things and one has to know all about them before one can produce them like Salters do. They are probably the worst used part of any piece of machinery. They are almost invariably neglected, and yet they are always expected to work even under conditions which no self-respecting engineer would dream of allowing any other part to work.

Some springs have to be made to very close limits indeed, not only as regards size, but also as regards extension and compression under load. Springs vary enormously; for example, at Salters you can see a spring weighing four hundredweight or you can have one of silver so fine that you really want a magnifying glass to see it.

Any and every form of spring comes out of their works. Flat springs, coil springs, laminated springs, circular springs—or any other kind you have ever heard about. In aircraft engines quite a large number of springs are used for a wide variety of purposes, and very few, if any, record flights have been made which were not to some extent dependent on Salters springs for their success.

SALMSON ENGINES CHEAPER

BRITISH SALMSON ENGINES have, as from May 1, decided to market their A.D.9 engine at £125. It is hoped by this means to help those constructors who are now pinning their faith to producing a light two-seater aircraft selling at under £400. This move will undoubtedly help to create a new and more numerous class of private owner and thereby provide a potential market for the more expensive machines. Simultaneously with this reduction, the A.D.9 will become known as the British Salmson "Junior." It is, of course, the smallest of the Salmson range, being a nine-cylinder air-cooled radial of 45 h.p. Its successes are well known both in this country and all over the world, particularly in connection with Klemm aircraft, while one of our best-known single-seater sporting aircraft, the Comper "Swift," also used this engine for some time. A leaflet describing the "Junior" will be sent on request, by British Salmson Aero Engines, Ltd., at Raynes Park, Surrey, to those who write mentioning FLIGHT.

THE WHY AND WHEREFORE OF PETROL

PETROL is undoubtedly a fuel about which the average man should know more than he does. In aviation economy is still of great importance, and it therefore behoves everyone to study the question of fuel so that he knows exactly how he can get the best results from his engine, while those who take part in competitions or races are also likely to benefit very much from increasing their knowledge of the fuel they use. Apart from this, practically everyone is a motorist, and for this reason also will find that there is a lot to be gained by knowing all about petrol. One of the best booklets we have ever seen on the subject has been written by Mr. F. R. Banks and is entitled "Petrol as it Applies to your Car." The name is perhaps a little misleading, as practically everything in the booklet also applies to the ordinary light aircraft. We advise all our readers who are interested to write to the H. K. McCann Co., Ltd., 49, Old Bond Street, W.1, mentioning FLIGHT. We understand that the booklet is also going to be distributed by the well-known petrol and oil companies, but those who wish to receive an early copy should write as directed above.

HENLY'S IN THE NORTH

HENLY'S, LTD., have appointed Mr. Kenneth Twemlow their North Country manager. Mr. Twemlow will have his office at Woodford Aerodrome, near Manchester, and will have complete charge of the aircraft sales and service activities of Henly's, Ltd., who besides their extensive secondhand business have the sole agency in this country for A. V. Roe's products.

AN AERIAL PHOTOGRAPHIC FIRM

PAN-AERO PICTURES, under the direction of Capt. G. Rose, is the name of a firm who are specialising in aerial photography, and working from Brooklands with a Breda 15 ("Gipsy") monoplane. The photographer is Mr. T. Wesson, who has had considerable experience of this type of work both in England and in South Africa. The offices of the company are in Gough House, Eden Street, Kingston-on-Thames, and they would welcome inquiries from the Press, factory owners, hotel proprietors, estate agents, contractors or others whose business necessitates the use of photographs from the air. Capt. Rose is one of the pilots who was engaged in flying gold dredging machinery from the coast to the gold mines in New Guinea, besides which he has had a very wide experience of flying in many countries.

The Breda 15 ("Gipsy") now being used at Brooklands by Pan-Aero Pictures for aerial photography. On the left is Mr. T. Wesson, the firm's photographer, and on the right Capt. G. Rose, the pilot.

Another Caterpillar

FLT. LT. R. R. NASH, attached to the R.A.F. Training Base, Leuchars, Fife, saved his life with an Irvin parachute on April 11, following a collision with another aeroplane flying in his formation. The pilot of the latter, Pilot Sergt. Dixon, was able to alight safely at Leuchars aerodrome. Membership of the Caterpillar Club has reached a total of 750, of which the British Empire claims 130. All the members of the club owe their lives to Irvin parachutes.

Mr. Boultbee Joins Klemm

MR. H. D. BOULTBEE has now severed his connection with the Civilian Aircraft Company and has joined the design staff of the British Klemm Aeroplane Co., Ltd. At present Mr. Boultbee is working on modifications of the original design to suit British requirements.

A Question of Wing Loadings

OUR attention has been called to a slip made in our Editorial Comment on the Do.X in our issue of April 13, 1933. The statement was made that "at the gross weight of 56 tons the wing loading is 24.6 lb./sq. ft., which is about that of our Schneider Trophy seaplanes!" This is, of course, quite incorrect, as the wing loading of the Supermarine-Rolls S.6B was actually 41.3 lb./sq. ft., which would give a landing speed of rather more than 100 m.p.h., while the Do.X was stated by Dr. Dornier in his paper to have a landing speed in the neighbourhood of 130 km./hr. (81 m.p.h.). The Do.X, on the other hand, has a relatively heavy power loading, while the S.6 Rolls-Royce engine carried a very low power loading, and we still hold that a wing loading of 24.6 lb./sq. ft. is too great for a commercial machine, even if the machine is as large as the Do.X.

THE ROYAL AIR FORCE

London Gazette, April 18, 1933

General Duties Branch

Pilot Officer R. G. M. Apthorp is promoted to rank of Flying Officer (Jan. 26); Flying Officer R. W. P. Collings takes rank and precedence as if his appointment as Flying Officer bore date July 1, 1929, immediately following Flying Officer W. R. Hartwright on the gradation list. Reduction takes effect from March 16: Wing Comdr. G. G. H. Cooke, D.S.C., A.F.C., is placed on half-pay list, Scale A, from April 17 to May 21 inclusive; Lt. C. P. Wade, R.N., Flying Officer, R.A.F., ceases to be attached to R.A.F. on return to Naval duty (March 15); Flight Lt. H. C. Pyper is placed on retired list (April 19); Flight Lt. E. A. Sullock, A.F.C., is transferred to Reserve, Class A (April 16). The follg. Flying Officers are transferred to Reserve, Class A:—J. Addison, P. Le M. C. Deacon, F. R. Jones, H. J. A. Williams (April 13); F. R. Balfour (April 18).

Dental Branch

Flying Officer J. E. Tyrrell, L.D.S., is promoted to rank of Flight Lt. (April 15).

ROYAL AIR FORCE RESERVE
RESERVE OF AIR FORCE OFFICERS

General Duties Branch

The follg. Pilot Officers are confirmed in rank:—M. F. Peacock (March 21); G. I. F. Thomson (March 22); B. T. Aikman (March 23); L. D'A. Orpen (March 26); H. L. Warren (March 30); R. Cave-Brown-Cave (March 31).

ROYAL AIR FORCE INTELLIGENCE

Appointments.—The following appointments in the Royal Air Force are notified:—

General Duties Branch

Wing Commander E. L. Howard-Williams, M.C., to Home Aircraft Depot, Henlow, 12.4.33, for Engineer duties, *vice* Sqd. Ldr. C. St. Noble.

Flight Lieutenants: D. A. Boyle, to H.Q., R.A.F. India, 7.4.33. W. N. Plenderleith, to R.A.F. Base, Singapore, 12.3.33. H. F. Bradley, to Station H.Q., Abingdon, 4.4.33. T. P. P. F. Fagan, to No. 16 (A.C.) Sqdn., Old Sarum, 12.4.33. G. Francis, to No. 201 (F.B.) Sqdn., Calshot, 10.4.33. T. H. French, D.F.C., to Superintendent of R.A.F. Reserve, Hendon, 12.4.33. D. Menzies, to No. 22 (B) Sqdn., Martlesham Heath, 5.4.33. T. F. Moloney, to No. 2 (A.C.) Sqdn., Manston, 12.4.33. J. F. Titmas, to No. 2 Flying Training School, Digby, 14.3.33.

Flying Officers: E. G. Granville, to No. 22 (B) Sqdn., Martlesham Heath, 3.4.33. R. S. Darbishire, to No. 2 Flying Training School, Digby, 1.4.33. C. J. Farrell, to No. 10 (B) Sqdn., Boscombe Down, 3.4.33. J. B. Fyfe, to No. 5 (A.C.) Sqdn., Quetta, India, 19.3.33. W. P. Welch, to Marine Aircraft Experimental Estabt., Felixstowe, 5.4.33. W. R. Farley, to No. 2 (A.C.) Sqdn., Manston, 3.4.33.

Acting Pilot Officers: The following Acting Pilot Officers are Posted to No. 2 Flying Training School, Digby, on 21.3.33, for advanced flying training:—W. D. Anderson, A. J. Biggar, G. D. M. Blackwood, H. D. U. Denison, C. Griffiths, A. J. D. Harding, J. H. Hill, N. Hope, E. M. Lewis, D. P. McKeown, J. H. R. Oldfield, A. S. Q. Robins, C. M. Stewart.

Stores Branch

Wing Commander F. A. Bladwin, to Air Ministry, Dept. of A.M.S.R. (D. of E.), 13.4.33, for Stores Staff duties, *vice* Wing-Com. W. B. Cushion, O.B.E.

Squadron Leaders: A. W. Turner, D.C.M., to H.Q., Air Defence of Gt. Britain, Uxbridge, 10.4.33, for Stores Staff duties, *vice* Sqd. Ldr. H. L. Woolveridge. H. L. Woolveridge, to Air Ministry, Dept. of A.M.S.R. (D. of E.), 13.4.33, for Stores Staff duties, *vice* Sqd. Ldr. A. W. Turner, D.C.M.

Flight Lieutenants: B. E. Essex, to H.Q., Fighting Area, Uxbridge, 12.4.33. H. D. Giblett, to No. 1 Stores Depot, Kidbrooke, 12.4.33.

Flying Officer A. Connock, to No. 28 (A.C.) Sqdn., Ambala, India, 12.3.33.

Accountant Branch

Flight Lieutenants B. G. Drake, to R.A.F. H.Q., Inland Area, Stanmore, 14.4.33.

Medical Branch

Flight Lieutenants: G. S. Strachan, to Central Med. Estab., 8.4.33. D. A. Wilson, to Station H.Q., Northolt, 10.4.33.

NAVAL APPOINTMENTS

The following appointments have been made by the Admiralty:—

Lieut. (F/O., R.A.F.).—N. S. Luard, to *Victory*, for R.A.F. Base, Gosport, for course (April 18), and to *Furious*, for 801 Squadron (April 25.

No. 2 Squadron Coming-of-Age Dinner.

A RE-UNION Dinner of past and present members of No. 2 Squadron will be held on May 13, the twenty-first anniversary of the formation of the Squadron. The dinner will take place at the Park Lane Hotel, Piccadilly, London. Tickets at 12s. 6d., exclusive of wines, may be obtained from The Secretary, No. 2 Squadron Coming-of-Age Dinner, Royal Air Force, Manston, Kent.

Vacancies for Aircraft Apprentices, R.A.F.

THE Air Ministry announces:—240 Aircraft Apprentices between the ages of 15 and 17 are required by the Royal Air Force for entry into the schools of technical training at Halton, Bucks., and at Cranwell, Lincs. They will be entered partly by competitive examination and partly by "Direct Entry" (on presentation of an approved first school certificate). Entry will take place in September, 1933, and an entrance examination will be conducted at numerous local centres on May 30, next. The sons of officers, warrant officers and Senior N.C.Os. of the three Services will receive special consideration. Full information regarding the examination, the methods of entry and the apprenticeship training scheme generally can be obtained upon application to the Secretary, Air Ministry (Aircraft Apprentices Department), Gwydyr House, Whitehall, London, S.W.1.

Successful candidates will be required to complete a period of 12 years' regular Air Force service from the age of 18, in addition to the previous training period. At the age of thirty they return to civil life, but will normally be given an opportunity to enter the R.A.F. Reserve for four years and to draw a gratuity of £100. A proportion, limited by the requirements of the service, may be permitted to re-engage to complete time for pension.

The scheme offers a good opportunity to well-educated boys of obtaining an apprenticeship course (normally of three years' duration) of a high standard, followed by interesting technical employment. Already more than 8,000 aircraft apprentices have completed their training at the technical schools of the Royal Air Force.

The skilled trades at present open to boys are those of fitter, wireless operator-mechanic, and instrument maker. The apprentices are given a thorough training in their trade by highly qualified technical instructors and their general education is also carried on during the same period by a staff of graduate teachers.

During the training period the present rate of pay is 1s. a day for the first two years and 1s. 6d. a day thereafter until the apprentice has both attained the age of 18 and been posted to a Unit on completing his apprenticeship training. When he is posted to a Unit for duty as an aircraftman, the commencing rate of pay at present varies from 3s. 6d. to 5s. 6d. a day (24s. 6d. to 38s. 6d. a week) according to the marks obtained in the passing out examination. He also receives free board and lodging and an allowance for uniform. Subsequently, there is the prospect of promotion subject to his having passed certain prescribed tests.

A few apprentices of special promise are granted free cadetships at the Royal Air Force College for training for commissioned rank.

For the remainder opportunities arise later to volunteer to qualify in flying and become airman pilots. About 100 of the latter are selected annually from volunteers of all trades. From amongst airman pilots a few are periodically selected for commissioned rank.

Civil Employment of Airmen after Discharge

WITH a view to enhancing the prospects of airmen in obtaining civil employment on their leaving regular service, the Air Ministry have arranged jointly with the other government departments and voluntary organisations concerned, a new procedure for registration, etc., for civil employment.

One year before the date on which an airman is due for discharge or transfer to the reserve, his C.O. will be notified by the Officer i/c Records. On receipt of this notification he will be interviewed by his squadron or section commander with the object of ascertaining the extent to which assistance can be given to him in the unit to prepare him for employment in civil life.

It is not intended that special instruction in the form of vocational training should be undertaken, but that use should be made of such facilities as are now available. Such assistance might be either by one of the courses or other instruction practicable under the Area Education Scheme, or by allowing the airman to attend workshops with those airmen who are preparing for trade test examinations.

Memorial to R.F.C. Pilot

A HEADSTONE of standard type is being erected in the North Road Cemetery to the memory of 2nd Lt. J. E. R. Young, Royal Flying Corps, who was killed near the Nore Light in an attack on raiding Gothas on July 7, 1917.

Bristol Engines on Commercial Services

A STATEMENT recently issued by the Directorate of Civil Aviation giving details regarding the regular air transport companies in service in Europe as at December 31, 1932, affords striking evidence of the leading place held by Bristol type air-cooled engines in the maintenance of commercial services. The services of Imperial Airways, Ltd., to take an example, are maintained with a fleet fitted with engines giving a total of 44,700 h.p., of which 35,575 h.p. are represented by Bristol engines. The balance is divided between four different types. (Incidentally the average pay-load per aircraft carried by Imperial Airways is 4,711.7 lbs., which is almost twice that carried by the aircraft of its closest rival.) Denmark is represented by a total of 1,865 h.p., of which Bristol engines account for 1,760 h.p. Hungary shows 4,050 h.p., composed entirely of engines of Bristol type. The total h.p. used on the European air routes is provided by nearly 40 different types of engines, ranging from 80 h.p. upwards, but approximately 20 per cent. of the h.p. is represented by engines of Bristol type. If only engines approximating in power to the Bristol type engines are taken into account the proportion is very much higher.

Germany's Private Flying

THE German Air Sport Federation is to have a uniform of grey blue. This organisation is one to which the German Aero Club, the Nazi Flying Corps, and practically all private flying clubs and organisations throughout Germany are affiliated. It claims 60,000 members, organised in about 1,000 clubs.

AIRCRAFT COMPANIES' STOCKS AND SHARES

AT the time of writing the stock and share markets are not showing any very definite tendency, sentiment being under the influence of Budget considerations and the abandonment of the gold standard by the United States. The possibility that competition for export business will be even keener if there is a heavy fall in the dollar in relation to sterling has had a reactionary influence in some directions, but, generally speaking, industrial shares have remained firm. The view is held in the market that as leading British aircraft companies have established an exceedingly high reputation abroad and overseas they can expect to continue to receive a fair share of business offering in export markets. On balance for the month Fairey Aviation are unchanged at 20s. 6d. The yield is on the small side, but a much larger dividend was earned last year than the 10 per cent., tax free, paid. The latter required £50,000, and as much as £78,106 was placed back into the business in the form of reserve allocation, etc. More interest has attached during the month to de Havilland, which have risen on balance from 18s. 9d. to 20s. 6d., accompanied by reports that the company is doing a better business. Rolls-Royce have been maintained, and there has been a rise on the month in Imperial Airways from 24s. to 27s. 6d. The latter company closed its year last month, and there are hopes of an increase in the dividend above the 3 per cent. paid for the previous year. As the results do not fall to be issued before September at the earliest, the directors may be influenced in their decision by developments during the next few months that may affect the outlook. D. Napier are better at 4s., compared with 3s. 6d., and the 8 per cent. preference 16s. 3d., compared with 12s. 6d., while the 7½ per cent. preference are 21s. 10½d. against 19s. 4½d. This reflects the tendency for more interest to attach to the shares since the reference at the annual meeting, mentioned in these notes last month, to a possible return of capital if and when the directors consider this justified. There has not been much business in Handley Page preference, which are same as a month ago. They may show more activity as the annual report falls to be issued late in May or in June. Vickers, which remained under the influence of the cautious tone of the chairman's speech at the annual meeting, are 6s. 1½d. at the time of writing, as against 6s. 7½d. a month ago. A point of interest was a recovery in Petters preference from 10s. to 12s. 6d., on the hope that it may be possible to recommend a payment on these shares in the next report. The company closed its year on March 31, but the results do not fall to be issued for some time yet. There has been an active business in Dunlop Rubber units, which are higher on the month at 21s., assisted by market hopes that the company has had a better experience and that a small dividend may be announced shortly. Triplex Safety Glass were also active, and are 45s. against 40s. 3d. a month ago.

Name	Class	Nominal Amount of Share c.	Last Annual Dividend	Current Week's Quotation
Anglo-American Oil	Deb.	Stk.	5½	101
Armstrong-Siddeley Develop.	Cum. Pref.	£1	6½	20/6
Birmingham Aluminium Castg.	Ord.	£1	5	24/–
Booth (James), 1915	Ord.	£1	15	56/6
Do. do.	Cum. Pref.	£1	7	28/4½
British Aluminium	Ord.	£1	5	25/–
Do. do.	Cum. Pref.	£1	6	22/4½
British Celanese	Ord.	10/–	Nil	7/–
British Oxygen	Ord.	£1	3	28/6
Do. do.	Cum. Pref.	£1	6½	25/7½
British Piston Ring	Ord.	£1	12½	33/–
British Thomson-Houston ..	Cum. Pref.	£1	7	27/–
Brown Brothers	Ord.	£1	10	33/9
Do. do.	Cum. Pref.	£1	7½	28/9
Dick (W. B.)	Cum. Pref.	£10	5	121/3
De Havilland Aircraft ..	Ord.	£1	2½	20/6
Dunlop Rubber	Ord.	c	Nil	21/–
Do. do.	"C" Cum. Pref.	16/–	10	22/3
En-Tout-Cas (System) ..	Def. Ord.	1/–	Nil	–/6
Do. do.	Ptg. Pfd. Ord.	5/–	Nil	2/–
Fairey Aviation	Ord.	10/–	10*	20/6
Do. do.	1st Mt. Deb.	Stk.	8	110
Firth (T.) & John Brown ..	Cum. Pref.	£1	6D	5/6
Do. do.	Cum. Pref.	£1	5*D	5/6
Ford Motor (England) ..	Ord.	£1	Nil	19/3
Fox (Samuel)	Mt. Deb.	Stk.	5	82½
Goodyear Tyre and Rubber ..	Deb.	Stk.	6½	104
Handley Page	Ptg. Pref.	8/–	10B	6/10½
Hoffmann Manufacturing ..	Ord.	£1	5	17/6
Do. do.	Cum. Pref.	£1	7½	23/1½
Imperial Airways	Ord.	£1	3	27/6
Kayser, Ellison	Ord.	£5	Nil	50/–
Do. do.	Cum. Pref.	£5	6	70/–
Lucas (Joseph)	Ord.	£1	20	88/9
Napier (D.), & Son	Ord.	5/–	Nil	4/–
Do. do.	Cum. Pref.	£1	7½	21/10½
Do. do.	Pref.	£1	8A	16/3
National Flying Services ..	Ord.	2/–	Nil	–/4½
Petters	Ord.	£1	Nil	7/6
Do.	Cum. Pref.	£1	7½	12/6
Roe (A.V.) (Cont. by Armstrong-Siddeley Devel., *q.v.*) ..	Ord.	£1	—	—
Rolls-Royce	Ord.	£1	10	48/9
Smith (S.) & Sons (M.A.) ..	Def. Ord.	1/–	Nil	3/6
Do. do.	Pt. Pfd. Ord.	£1	7	34/4½
Do. do.	Cum. Pref.	£1	7½	23/9
Serck Radiators	Ord.	£1	12½	30/6
"Shell" Transport and Trading	Ord.	£1	7½*	42/6
Do. do.	Cum. Pref	£10	5	£11½
Triplex Safety Glass	Ord.	10/–	10E	45/–
Vickers	Ord.	6/8	4	6/1½
Do.	Cum. Pref.	£1	5*	18/9
Vickers Aviation (Cont. by Vickers, *q.v.*)	—	—	—	—
Westland Aircraft (Branch of Petters, *q.v.*)	—	—	—	—

* Dividend paid, tax free. C £1 unit of stock. D Last xd. March, 1931. A Last xd. September, 1931. B Last xd. July, 1932. E On shares of £1 denomination.

Brian Lewis Aviation Tour

DURING the first two weeks in May a demonstration tour of England, Scotland, and Ireland is being carried out in a D.H. Dragon, to demonstrate this machine to likely commercial and private customers. Information can be obtained from the company's London office, 30, Conduit Street, or from Hooton Park Aerodrome. The following is the itinerary for the month of May:—1st, Cambridge-Norwich-Nottingham; 2nd, Manchester-Liverpool-Blackpool; 3rd, free day; 4th, Yeadon-Cramlington-Edinburgh; 5th, Inverness; 6th, Glasgow-Belfast; 7th, free day; 8th, Dublin-Hooton; 9th, Birmingham-Bristol; 10th, Cardiff-Plymouth; 11th, free day; 12th, Southampton-Portsmouth-Isle of Wight; 13th, Shoreham-Brighton-Eastbourne; 14th, free day.

PUBLICATIONS RECEIVED

Technical Report of the Aeronautical Research Committee, 1931-32. Vol. I, *Aerodynamics, Airships and Meteorology*. Vol. II. *Stability and Control Spinning, Strength of Construction, Materials, etc.* London: H.M. Stationery Office, W.C.2. Price: Vol. I, £1 15s. net. Vol. II, £1 7s. 6d. net.

Gravesend School of Flying. The Gravesend School of Flying, The Airport, Gravesend.

Pilot's "A" Licence. 5th Edition. By John F. Leeming. London: Sir Isaac Pitman and Sons, Ltd. Price 3s. 6d.

Modern Technology: A Select List of Recent Books available at the Coventry Public Libraries. City Librarian, Coventry Public Libraries, Trinity Churchyard, Coventry.

Meteorological Office Professional Notes: No. 64. *The Vertical Extent of North-Westerly Winds Over Iraq in Summer*. By S. P. Peters, B.Sc. Air Ministry, M.O. 336d. London: H.M. Stationery Office. Price 3d. net.

Report on the Economic Situation in Finland at the Beginning of 1933. No. C. 4104. April, 1933. Department of Overseas Trade, 35, Old Queen Street, S.W.1.

Development of Disarmament Deliberations from the Beginning of the Conference to the end of 1932. Reprint from the English Supplement of the "Zeitschrift für Politik." Carl Heymanns Verlag, Berlin, W.8. Price RM. 2.50.

NEW COMPANIES REGISTERED

HIGHLAND AIRWAYS, LTD., 36, Academy Street, Inverness.—Capital £2,675, in 2,500 ordinary shares of £1 each and 3,500 deferred shares of 1s. each. Aerodrome proprietors, flying instructors, owners, hirers, manufacturers and repairers of all kinds of aircraft, etc. Directors: R. Donald, Bairobert, Inverness, motor engineer; R. Wotherspoon, Branxholme, Inverness, solicitor; Thomas H. W. Alexander, Woodpark, Llanbryde, Morayshire, F.R.C.S.; Ernest E. Fresson, Hooton Park Aerodrome, Cheshire, flying officer; Col. J. J. Robertson, D.S.O., Norwood, Wick. Secretary: W. Hamilton. (Scottish company.)

AEROMODELS, LTD., Hooton Road, Willaston, Wirral, Ches.—Capital, £980 in 700 ordinary shares of £1 and 700 founders' shares of 8s. each. Manufacturers of and dealers in models and toys of all kinds, and of automobiles, aeroplanes, engines, etc. Directors: Ernest A. Davis, 34, Pitville Avenue, Mossley Hill, Liverpool; Herbert Dodson, Greyholme, Hooton Road, Willaston, Wirral; Geo. M. Edye, 12, Tite Street, Chelsea, S.W.3 (director of Comper Aircraft Co., Ltd., and Pobjoy Air Motors, Ltd.).

AERONAUTICAL PATENT SPECIFICATIONS

Abbreviations: Cyl. = cylinder; i.c. = internal combustion; m. = motors. (The numbers in brackets are those under which the Specifications will be printed and abridged, etc.)

APPLIED FOR IN 1931

Published April 27, 1933

27,242 A. LIPPISCH. Aircraft aerofoils. (390,201)
31,116 J. P. LANDRUM. Variable-pitch propeller. (390,241)
31,117 J. P. LANDRUM. Variable-pitch propeller. (390,242)

APPLIED FOR IN 1932

Published April 27, 1933

17,417 H. MAINGUET. Method of increasing the sustaining and propelling power of wings. (390,363)
24,537 R. TALAFRE and H. RENAULT. Devices for indicating the flying attitude of aircraft. (390,410)
27,559 C. V. L. FOLEY. Aircraft. (390,432)
36,505 C. ROSCATELLI. Aircraft tail chassis. (390,469)